

Evaluation of the Integral $\int_0^p u^n e^{-u^2} (u+x)^{-1} du$

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Abstract. The representations of the above integral, in a power series form for small values of x and in an asymptotic form for large values of x , are given for integer values of n . In view of the usefulness of this integral, tabulated values are also presented for a wide range of values of x and p , and for a few values of n .

1. Introduction. Integrals involving exponential functions occur frequently in several problems in kinetic theory and generally in mathematical physics (cf. [1]–[5], [7]). An integral of the form $\int_0^\infty e^{-u^2} (u+x)^{-1} du$ has been discussed in [2], [3], [4], [7], and a particular integral of the form $\int_0^p e^{-u^2} (u+x)^{-1} du$ has been evaluated in [5]. This last integral is generalized and its representation, both in a power series form for small values of x and in an asymptotic form for large values of x , are given for integral values of n . In view of the usefulness of this generalized integral, tabulated values are also presented for a wide range of values of x and p , and for a few values of n .

The integral

$$(1) \quad f_n(x, p) = \int_0^p u^n e^{-u^2} (u+x)^{-1} du$$

is considered, and its analytic representations are given for small as well as for large values of x . For small values of x , we can write

$$(2) \quad \begin{aligned} f_n(x, p) = \int_0^p [& u^{n-1} - xu^{n-2} + x^2u^{n-3} \\ & + \dots + (-1)^r x^r u^{n-r-1} + \dots + (-1)^{n-1} x^{n-1}] e^{-u^2} du \\ & + (-1)^n x^n \int_0^p e^{-u^2} (u+x)^{-1} du. \end{aligned}$$

All the integrals except the last one in (2) can be expressed in terms of the incomplete gamma functions, and the last one can be evaluated as follows.

If we write

$$f_0(x, p) = \int_0^p e^{-u^2} (u+x)^{-1} du$$

and set $y = f_0 + e^{-x^2} \ln x$, then it can be seen that y satisfies the differential equation

$$(3) \quad \frac{dy}{dx} + 2xy = \sqrt{\pi} \operatorname{erf} p + \frac{e^{-p^2}}{p+x} - \frac{1}{x} (1 - e^{-x^2}),$$

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where

$$\operatorname{erf} p = \frac{2}{\sqrt{\pi}} \int_0^p e^{-u^2} du.$$

Assuming a series solution of the form

$$(4) \quad y = \sum_{k=0}^{\infty} a_k x^k$$

for the differential equation (3), we obtain the coefficients a_k . They are given below.

$$(5) \quad a_0 = \ln p - \frac{1}{2} \sum_{n=1}^{\infty} \frac{(-1)^{n-1} p^{2n}}{n \cdot n!},$$

$$(6) \quad a_1 = 2 \int_0^p e^{-u^2} du + e^{-p^2}/p,$$

$$(7) \quad a_{2k+2} = \frac{a_{2k}}{k+1} - \frac{e^{-p^2}}{2(k+1)p^{2k+2}} - \frac{(-1)^k}{2(k+1)[(k+1)!]},$$

$k = 0, 1, 2, \dots,$

$$(8) \quad a_{2k+1} = \frac{-2a_{2k-1}}{2k+1} + \frac{e^{-p^2}}{(2k+1)p^{2k+1}}, \quad k = 1, 2, \dots$$

The coefficients a_{2k+1} and a_{2k} may also be expressed as follows:

$$(9) \quad a_{2k+1} = \frac{(-1)^k a_1}{\left(\frac{3}{2}\right)_k} - \frac{(-1)^k e^{-p^2}}{\left(\frac{3}{2}\right)_k} \sum_{r=1}^k \frac{(-1)^{r+1} \left(\frac{1}{2}\right)_r}{p^{2r+1}}, \quad k = 1, 2, \dots,$$

$$(10) \quad a_{2k} = \frac{(-1)^k a_0}{k!} + \frac{(-1)^k e^{-p^2}}{2k!} \sum_{r=0}^{k-1} \frac{(-1)^r r!}{p^{2r+0}} + \frac{(-1)^k}{2k!} \sum_{r=0}^{k-1} \frac{1}{r+1}, \quad k = 1, 2, \dots,$$

where $(a)_k = \Gamma(k+a)/\Gamma(a)$. But for machine computations, it is more economical to use (7) and (8), rather than (9) and (10).

Thus $f_n(x, p)$ is given by

$$(11) \quad \begin{aligned} f_n(x, p) &= \int_0^p u^n e^{-u^2} (u+x)^{-1} du \\ &= \frac{1}{2} \gamma\left(\frac{n}{2}, p^2\right) - \frac{x}{2} \gamma\left(\frac{n}{2} - \frac{1}{2}, p^2\right) + \frac{x^2}{2} \gamma\left(\frac{n}{2} - 1, p^2\right) \\ &\quad + \dots + (-1)^r \frac{x^r}{2} \gamma\left(\frac{n}{2} - \frac{r}{2}, p^2\right) + \dots + (-1)^{n-1} \frac{x^{n-1}}{2} \gamma\left(\frac{1}{2}, p^2\right) \\ &\quad + (-1)^n x^n \left[\sum a_k x^k - e^{-x^2} \ln x \right], \end{aligned}$$

where a_k 's are given by (5), (6), (7), and (8); and $\gamma(a, x)$ is the incomplete gamma function given by

$$(12) \quad \gamma(a, x) = \int_0^x e^{-t} t^{a-1} dt.$$

2. An Alternative Approach. Since $1/(u+x) = (1-x/(x+u))/u$, it follows that

$$(13) \quad f_n(x, p) = C_{n-1}(p) - x f_{n-1}(x, p),$$

where

$$(14) \quad C_n(p) = \int_0^p u^n e^{-u^2} du.$$

Clearly,

$$(15) \quad C_0(p) = \int_0^p e^{-u^2} du = \frac{\sqrt{\pi}}{2} \operatorname{erf}(p),$$

$$(16) \quad C_1(p) = \frac{1}{2}(1 - e^{-p^2}).$$

Further,

$$(17) \quad C_{n+2}(p) = -\frac{1}{2} p^{n+1} e^{-p^2} + \frac{1}{2}(n+1) C_n(p).$$

So

$$(18) \quad C_{2n} = -\left(\frac{1}{2}\right)_n p e^{-p^2} \sum_{k=0}^{n-1} \frac{p^{2k}}{\left(\frac{3}{2}\right)_k} + \left(\frac{1}{2}\right)_n C_0,$$

and

$$(19) \quad C_{2n+1} = -\frac{1}{2} n! p^2 e^{-p^2} \sum_{k=0}^{n-1} \frac{p^{2k}}{(k+1)!} + n! C_1.$$

In most cases it is easier to compute C_n by the recursion relation (17) than it is to use (18) and (19), and the same is true for f_n using (13). Of course, if n is large, stability problems can arise. If the C_n are known, use of (13) in the forward (backward) directions is stable as n becomes large if $x < 1$ ($x > 1$). On the other hand, use of (17) is not stable in the forward direction as n becomes large. In (14), we use the exponential series to get (in hypergeometric notation)

$$(20) \quad C_n(p) = \frac{p^{n+1}}{n+1} {}_1F_1\left(\frac{n+1}{2} \middle| \frac{n+1}{2} + 1 \middle| -p^2\right) = \frac{p^{n+1} e^{-p^2}}{n+1} {}_1F_1\left(\frac{1}{2} \middle| \frac{n+1}{2} + 1 \middle| p^2\right),$$

which is convenient for p fixed and n large.

Combining (13) and (17), we have

$$(21) \quad x f_n + f_{n+1} - \frac{2x f_{n+2}}{n+1} - \frac{2f_{n+3}}{n+1} = \frac{p^{n+1} e^{-p^2}}{n+1}.$$

This is advantageous since the need of C_n is bypassed. On the other hand, there are obvious stability and round-off difficulties. Still the expression is quite useful for moderate n and x provided sufficient round-off controls can be initiated.

Repeated use of (13) gives

$$(22) \quad f_n = \sum_{k=0}^{n-1} (-1)^k x^k C_{n-k-1} + (-1)^n x^n f_0,$$

which is the same as Eq. (11) given above.

For large values of x and for $p < x$

$$(23) \quad f_n(x, p) = \frac{1}{x} \sum_{k=0}^{\infty} x^{-2k} C_{n+2k} - \frac{1}{x^2} \sum_{k=0}^{\infty} x^{-2k} C_{n+2k+1},$$

which is the same as Eq. (24) below.

3. Asymptotic Representation for Large x . When $p < x$, the function $f_n(x, p)$ can be written as

$$(24) \quad f_n(x, p) = \int_0^p \frac{u^n e^{-u^2}}{x(1+u/x)} du = \sum_{k=0}^{\infty} \frac{1}{x^{2k+1}} \int_0^p u^{2k+n} e^{-u^2} du \\ - \sum_{k=0}^{\infty} \frac{1}{x^{2k+2}} \int_0^p u^{2k+n+1} e^{-u^2} du.$$

Now we consider the odd and even values of n separately. Let $n = 2m$,

$$(25) \quad f_{2m}(x, p) = \sum_{k=0}^{\infty} \frac{1}{x^{2k+1}} \int_0^p u^{2k+2m} e^{-u^2} du \\ - \sum_{k=0}^{\infty} \frac{1}{x^{2k+2}} \int_0^p u^{2k+2m+1} e^{-u^2} du \\ = \sum_{k=0}^{\infty} \left[\left\{ \frac{(2k+2m-1)(2k+2m-3) \cdots 3 \cdot 1 \sqrt{\pi}}{2^{k+m+1}} \frac{\operatorname{erf} p}{x^{2k+1}} \right. \right. \\ \left. \left. - \frac{(2k+2m)(2k+2m-2) \cdots 4 \cdot 2}{2^{k+m+1}} \frac{(1-e^{-p^2})}{x^{2k+2}} \right\} \right. \\ \left. + \frac{e^{-p^2}}{2} \left\{ \frac{p^{2k+2m}}{x^{2k+2m}} - \frac{p^{2k+2m-1}}{x^{2k+1}} \right\} \right] \\ + \frac{e^{-p^2}}{2} \sum_{k=0}^{\infty} \sum_{r=1}^{k+m-1} \left\{ \frac{(2k+2m)(2k+2m-2) \cdots (2k+2m-2r+2)}{2^r} \frac{p^{2k+2m-2r}}{x^{2k+2}} \right. \\ \left. - \frac{(2k+2m-1)(2k+2m-3) \cdots (2k+2m-2r+1)}{2^r} \frac{p^{2k+2m-2r-1}}{x^{2k+1}} \right\}.$$

If $n = 2m + 1$,

$$(26) \quad f_{2m+1}(x, p) = \sum_{k=0}^{\infty} \frac{1}{x^{2k+1}} \int_0^p u^{2k+2m+1} e^{-u^2} du \\ - \sum_{k=0}^{\infty} \frac{1}{x^{2k+2}} \int_0^p u^{(2k+2m+2)} e^{-u^2} du \\ = \sum_{k=0}^{\infty} \left[\left\{ \frac{(2k+2m)(2k+2m-2) \cdots 4 \cdot 2}{2^{k+m+1}} \frac{1-e^{-p^2}}{x^{2k+1}} \right. \right. \\ \left. \left. - \frac{(2k+2m+1)(2k+2m-1) \cdots 3 \cdot 1 \sqrt{\pi}}{2^{k+m+2}} \frac{\operatorname{erf} p}{x^{2k+2}} \right\} \right. \\ \left. + \frac{e^{-p^2}}{2} \left\{ \frac{p^{2k+2m+1}}{x^{2k+2}} - \frac{p^{2k+2m}}{x^{2k+1}} \right\} \right] \\ + \frac{e^{-p^2}}{2} \sum_{k=0}^{\infty} \sum_{r=1}^{k+m} \frac{(2k+2m+1)(2k+2m-1) \cdots (2k+2m-2r+3)}{2^r} \frac{p^{2k+2m-2r+1}}{x^{2k+2}} \\ - \frac{e^{-p^2}}{2} \sum_{k=0}^{\infty} \sum_{r=1}^{k+m-1} \frac{(2k+2m+1)(2k+2m-1) \cdots (2k+2m-2r+3)}{2^r} \frac{p^{2k+2m-2r+1}}{x^{2k+2}}.$$

Asymptotic expansions for the case $p > x$ have not been shown, although they can be easily derived. However, mention may be made about the difficulties associated with asymptotic expansions of functions of several independent variables such as p , x , and n that characterize the present problem. General methods for deriving the appropriate expansions are discussed in [6], [8], and [9].

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N =	P	X				
		0.2	0.4	0.6	0.8	1.0
0	0.10	0.40425003	0.22244239	0.153655773	0.11740285	0.09500092
0	0.25	0.79747987	0.47673512	0.34178515	0.26674104	0.21882963
0	0.50	1.18251896	0.75982618	0.56584454	0.45221686	0.37708789
0	0.75	1.39053917	0.92654311	0.70498991	0.57163489	0.48168701
1	1.00	1.50040054	1.01892471	0.78470337	0.64174099	0.54425645
1	1.25	1.55467796	1.06599808	0.82625818	0.6789384	0.57792646
1	1.50	1.57925510	1.08777523	0.84581006	0.69667739	0.59115781
1	1.75	1.58935165	1.09686184	0.85407192	0.70425236	0.60115069
2	2.00	1.59308624	1.10026073	0.85719633	0.70714056	0.60383701
2	2.25	1.59432411	1.10140324	0.85825127	0.70812249	0.60475606
2	2.50	1.59469318	1.10174561	0.85856795	0.70841950	0.60503554
2	2.75	1.59478283	1.10183907	0.85865402	0.70849955	0.60511231
3	3.00	1.59480858	1.10185432	0.85867333	0.70851868	0.60512835
3	3.25	1.59481430	1.10185814	0.85867757	0.70852298	0.60513109
3	3.50	1.59481239	1.10186005	0.85867822	0.70852375	0.60513276
3	3.75	1.59481239	1.10185909	0.85867858	0.70852339	0.60513288
4	4.00	1.59481430	1.10185623	0.85867852	0.70852345	0.60513312
4	4.25	1.59481335	1.10185814	0.85867882	0.70852345	0.60513276
4	4.50	1.59481239	1.10186005	0.85867882	0.70852351	0.60513365
4	4.75	1.59481430	1.10186195	0.85867868	0.70867401	0.60513377
5	5.00	1.59481335	1.10186291	0.85867780	0.70852345	0.60513377

P	X				
	1.5	2.0	3.0	4.0	5.0
0.10	0.06432742	0.04862998	0.03268173	0.02461105	0.01973713
0.25	0.15111786	0.11544436	0.07843828	0.05940349	0.04780449
0.50	0.26693827	0.20679057	0.14265782	0.10892212	0.08809996
0.75	0.34670386	0.27136558	0.18937039	0.14551497	0.11817753
1.00	0.39610386	0.31206781	0.21553613	0.16947830	0.13805443
1.25	0.42332035	0.33490866	0.23682004	0.18338042	0.14968193
1.50	0.443671268	0.34630644	0.24560267	0.19052434	0.15570223
1.75	0.44257915	0.35135945	0.24955833	0.19377470	0.15846068
2.00	0.44485487	0.35334849	0.25113757	0.19508415	0.15957916
2.25	0.44565600	0.35404283	0.25169617	0.19555191	0.15998018
2.50	0.44589829	0.35425764	0.25187111	0.19569808	0.16010743
2.75	0.44596553	0.35431713	0.25191957	0.19573951	0.16014320
3.00	0.44598460	0.35433441	0.25193153	0.19574970	0.16015208
3.25	0.44598073	0.35433161	0.25193423	0.19575191	0.16015387
3.50	0.44598502	0.35433513	0.25193423	0.19575226	0.16015428
3.75	0.44598514	0.35433531	0.25193465	0.19575248	0.16015458
4.00	0.44598514	0.35433507	0.25193483	0.19575244	0.16015452
4.25	0.44598496	0.35433489	0.25193447	0.19575244	0.16015446
4.50	0.44598496	0.35433471	0.25193441	0.19575244	0.16015446
4.75	0.44598484	0.35433483	0.25193393	0.19575197	0.16015428
5.00	0.44598556	0.35433549	0.25193465	0.19575208	0.16015440

P	X				
	6.0	7.0	8.0	9.0	10.0
0.10	0.01647458	0.01413765	0.01238136	0.01101321	0.00991734
0.25	0.03959564	0.03437996	0.03014719	0.02684249	0.02419074
0.50	0.07396466	0.06373960	0.05599904	0.04993534	0.04505673
0.75	0.09949666	0.08591968	0.07560515	0.06750280	0.06096961
1.00	0.11647779	0.10074162	0.08875507	0.07931966	0.07169884
1.25	0.12647051	0.10950249	0.09655458	0.08634782	0.07809472
1.50	0.13167268	0.11408240	0.10064507	0.09004366	0.08146501
1.75	0.13406843	0.11619973	0.10254198	0.09176177	0.08303505
2.00	0.13506446	0.11706561	0.10332000	0.09246796	0.08368176
2.25	0.13539600	0.11737859	0.10360149	0.09272456	0.08391726
2.50	0.13550818	0.11747867	0.10369253	0.09280705	0.08399314
2.75	0.13553965	0.11750686	0.10371792	0.09283036	0.08401459
3.00	0.13554758	0.11751401	0.10372442	0.09283644	0.08401996
3.25	0.13554925	0.11751550	0.10372591	0.09283763	0.08402067
3.50	0.13554949	0.11751568	0.10372591	0.09283787	0.08402133
3.75	0.13554966	0.11751580	0.10372615	0.09283793	0.08402139
4.00	0.13554966	0.11751582	0.10372615	0.09283787	0.08402133
4.25	0.13554972	0.11751580	0.10372615	0.09283787	0.08402139
4.50	0.13554955	0.11751586	0.10372615	0.09283787	0.08402145
4.75	0.13554960	0.11751574	0.10372621	0.09283793	0.08402139
5.00	0.13554960	0.11751580	0.10372615	0.09283793	0.08402157

N = 1	P	x				
		0.2	0.4	0.6	0.8	1.0
	0.10	0.01881764	0.01069060	0.00747251	0.00574524	0.00466674
	0.25	0.08535164	0.05419369	0.03981648	0.03149450	0.02605814
	0.50	0.22477663	0.15734977	0.12177354	0.09950727	0.08419275
	0.75	0.35213637	0.25962687	0.20725089	0.17293733	0.14855766
	1.00	0.44674289	0.33925259	0.27600139	0.23343104	0.20256764
	1.25	0.50696224	0.39150029	0.32214355	0.27474767	0.23997229
	1.50	0.54033589	0.42107749	0.34870112	0.29884565	0.26202953
	1.75	0.55654377	0.43566942	0.36197056	0.31101239	0.27326298
	2.00	0.56346309	0.44197500	0.36776292	0.31636798	0.27824306
	2.25	0.56606424	0.44436800	0.36997920	0.31843185	0.28017426
	2.50	0.56692636	0.44516832	0.37072438	0.31912953	0.28082907
	2.75	0.56717771	0.44540328	0.37095486	0.31933182	0.28102368
	3.00	0.56724411	0.44546437	0.37100202	0.31939101	0.28107780
	3.25	0.56725907	0.44547838	0.37101585	0.31940424	0.28108966
	3.50	0.56726176	0.44548118	0.37101841	0.31940651	0.28109199
	3.75	0.56726235	0.44548112	0.37101889	0.31940711	0.28109235
	4.00	0.56726259	0.44548172	0.37101907	0.31940699	0.28109229
	4.25	0.56726235	0.44548124	0.37101883	0.31940693	0.28109205
	4.50	0.56726241	0.44548112	0.37101901	0.31940734	0.28109294
	4.75	0.56726205	0.44548088	0.37101889	0.31940681	0.28109181
	5.00	0.56726182	0.44548190	0.37101895	0.31940693	0.28109211

P	x					
	1.5	2.0	3.0	4.0	5.0	
	0.10	0.00317645	0.00240765	0.00162244	0.00122344	0.00098196
	0.25	0.01821086	0.01399892	0.00957268	0.00727372	0.00586521
	0.50	0.06087315	0.04769936	0.03330655	0.02559210	0.02078055
	0.75	0.11096665	0.08751369	0.06213342	0.04818486	0.03935676
	1.00	0.15266752	0.12268740	0.08821547	0.06891060	0.05655171
	1.25	0.18291724	0.14398065	0.10743785	0.08437556	0.06948811
	1.50	0.20111829	0.16357434	0.11937954	0.09409028	0.07767606
	1.75	0.21054476	0.17169440	0.12573791	0.09531523	0.08211040
	2.00	0.21478248	0.17538303	0.12866668	0.10174394	0.08419800
	2.25	0.21644557	0.17684317	0.12984075	0.10272563	0.08502807
	2.50	0.21701616	0.17734855	0.13025177	0.10307187	0.08532768
	2.75	0.21718717	0.17750198	0.13031783	0.10317880	0.08542049
	3.00	0.21723413	0.17754275	0.13041163	0.10321077	0.08544576
	3.25	0.21724713	0.17755413	0.13041567	0.10321468	0.08545172
	3.50	0.21724731	0.17755467	0.13042116	0.10321605	0.08545297
	3.75	0.21724731	0.17755467	0.13042140	0.10321617	0.08545321
	4.00	0.21724713	0.17755467	0.13042164	0.10321623	0.08545321
	4.25	0.21724745	0.17755479	0.13042164	0.10321635	0.08545321
	4.50	0.21724755	0.17755473	0.13042158	0.10321623	0.08545315
	4.75	0.21724755	0.17755473	0.13042158	0.10321635	0.08545327
	5.00	0.21724749	0.17755473	0.13042156	0.10321623	0.08545327

P	x					
	6.0	7.0	8.0	9.0	10.0	
	0.10	0.00082009	0.00070404	0.00061676	0.00054873	0.00049422
	0.25	0.00431373	0.00422790	0.00371007	0.00330525	0.00298009
	0.50	0.01749247	0.01510302	0.01328804	0.01186254	0.01071329
	0.75	0.03326480	0.02880696	0.02540322	0.02271910	0.02054814
	1.00	0.04795693	0.04163236	0.03678280	0.03294581	0.02983411
	1.25	0.05907555	0.05138110	0.04546222	0.04076734	0.03695206
	1.50	0.06615138	0.05761093	0.05102665	0.04575488	0.04153718
	1.75	0.07000309	0.06101525	0.05407679	0.04855751	0.04406188
	2.00	0.07181364	0.06262141	0.05552004	0.04986782	0.04526170
	2.25	0.07255310	0.06327962	0.05611311	0.05040750	0.04575678
	2.50	0.07281643	0.06351477	0.05632557	0.05060127	0.04593484
	2.75	0.07289985	0.06358826	0.05639211	0.05066206	0.04599024
	3.00	0.07292080	0.06360841	0.05641037	0.05067877	0.04600624
	3.25	0.07292616	0.06361324	0.05641475	0.05068240	0.04600996
	3.50	0.07292753	0.06361443	0.05641569	0.05068365	0.04601074
	3.75	0.07292753	0.06361443	0.05641569	0.05068380	0.04601088
	4.00	0.07292753	0.06361443	0.05641569	0.05068384	0.04601092
	4.25	0.07292753	0.06361443	0.05641562	0.05068386	0.04601094
	4.50	0.07292747	0.06361437	0.05641562	0.05068386	0.04601094
	4.75	0.07292753	0.06361443	0.05641562	0.05068384	0.04601093
	5.00	0.07292753	0.06361437	0.05641562	0.05068388	0.04601093

N = 2	P	X				
		0.2	0.4	0.6	0.8	1.0
0.10	0.00121155	0.00069884	0.00049133	0.00037889	0.00030834	
0.25	0.01321511	0.00861596	0.00640354	0.00509784	0.00423529	
0.50	0.06564420	0.04765955	0.03753531	0.03099367	0.02640670	
0.75	0.14468104	0.11125755	0.09075773	0.07675856	0.06655061	
1.00	0.22671139	0.18035877	0.15045923	0.12931526	0.11349213	
1.25	0.29380119	0.23859382	0.20190752	0.17539585	0.15522027	
1.50	0.33923274	0.27886497	0.23807865	0.20822304	0.18527013	
1.75	0.36530548	0.30234617	0.25943154	0.22780383	0.20335078	
2.00	0.37814897	0.31405151	0.27018398	0.23774701	0.21259785	
2.25	0.38262169	0.31908703	0.27484651	0.24208903	0.21666014	
2.50	0.38564949	0.32096990	0.27655541	0.24373031	0.21820354	
2.75	0.38650366	0.32157838	0.27717263	0.24426967	0.21871281	
3.00	0.38649991	0.32175201	0.27733554	0.24442416	0.21885955	
3.25	0.38653451	0.32179493	0.27737713	0.24446315	0.21889639	
3.50	0.38654464	0.32180625	0.27738589	0.24447137	0.21890450	
3.75	0.38654649	0.32180625	0.27738744	0.24447330	0.21890519	
4.00	0.38654673	0.32180643	0.27738786	0.24447334	0.21890610	
4.25	0.38654697	0.32180643	0.27738804	0.24447322	0.21890628	
4.50	0.38654691	0.32180655	0.27738798	0.24447340	0.21890622	
4.75	0.38654697	0.32180661	0.27738786	0.24447322	0.21890634	
5.00	0.38654661	0.32180673	0.27738792	0.24447352	0.21890640	

P	X				
	1.5	2.0	3.0	4.0	5.0
0.10	0.00021041	0.00015970	0.00010776	0.00008131	0.00006529
0.25	0.00297715	0.00229561	0.00157482	0.00119855	0.00096742
0.50	0.01928976	0.01520072	0.01067846	0.00823114	0.00669677
0.75	0.05000827	0.04008095	0.02870792	0.02236875	0.01832464
1.00	0.08705854	0.07068509	0.05141361	0.04041724	0.03330154
1.25	0.12081778	0.09903234	0.07287957	0.05769125	0.04775330
1.50	0.14562213	0.12015174	0.08916116	0.07093861	0.05891573
1.75	0.16079682	0.13322502	0.09940034	0.07935327	0.06606203
2.00	0.16866714	0.14007533	0.10484082	0.08386523	0.06991625
2.25	0.17216605	0.14314812	0.10731184	0.08593154	0.07169181
2.50	0.17350906	0.14433682	0.10827845	0.08674604	0.07239556
2.75	0.17395633	0.14473540	0.10860598	0.08702351	0.07263690
3.00	0.17408597	0.14485180	0.10870242	0.08710629	0.07270879
3.25	0.17411888	0.14488143	0.10872716	0.08712751	0.07272738
3.50	0.17412603	0.14488804	0.10873270	0.08713222	0.07273149
3.75	0.17412746	0.14488918	0.10873371	0.08713329	0.07273245
4.00	0.17412770	0.14488947	0.10873383	0.08713325	0.07273245
4.25	0.17412770	0.14488953	0.10873385	0.08713347	0.07273251
4.50	0.17412788	0.14488959	0.10873401	0.08713347	0.07273257
4.75	0.17412782	0.14488947	0.10873401	0.08713347	0.07273251
5.00	0.17412788	0.14488959	0.10873395	0.08713347	0.07273257

P	X				
	6.0	7.0	8.0	9.0	10.0
0.10	0.00005454	0.00004683	0.00004103	0.00003651	0.00003285
0.25	0.00081103	0.00069817	0.00061288	0.00054616	0.00049255
0.50	0.00564468	0.00487834	0.00429523	0.00383666	0.00346656
0.75	0.01551963	0.01345968	0.01188266	0.01063651	0.00962697
1.00	0.02831845	0.02463354	0.02179771	0.01954768	0.01771887
1.25	0.04074075	0.03526224	0.03149621	0.02828798	0.02567327
1.50	0.05039141	0.04402345	0.03908632	0.03514597	0.03192795
1.75	0.05695946	0.04950739	0.04399978	0.03959647	0.03599527
2.00	0.06151553	0.05249156	0.04668131	0.04203111	0.03822461
2.25	0.06213548	0.05387712	0.04792980	0.04316718	0.03926687
2.50	0.06213548	0.05443044	0.04842966	0.04362302	0.03968578
2.75	0.06234874	0.05462147	0.04880265	0.04378113	0.03983136
3.00	0.06241249	0.05469378	0.04885465	0.04382876	0.03987527
3.25	0.06243288	0.05469378	0.04886825	0.04384123	0.03988678
3.50	0.06243361	0.05469713	0.04887139	0.04384407	0.03988944
3.75	0.06243361	0.05469776	0.04887201	0.04384465	0.03988996
4.00	0.06243372	0.05469789	0.04887211	0.04384474	0.03989003
4.25	0.06243372	0.05469790	0.04887212	0.04384475	0.03989004
4.50	0.06243370	0.05469788	0.04887211	0.04384473	0.03989005
4.75	0.06243374	0.05469793	0.04887209	0.04384469	0.03989002
5.00	0.06243377	0.05469794	0.04887214	0.04384476	0.03989005

N = 3	P	X				
		0.2	0.4	0.6	0.8	1.0
	0.10	0.00008903	0.00005180	0.00003654	0.00002823	0.00002300
	0.25	0.00237428	0.00157092	0.00117518	0.00093903	0.00078202
	0.50	0.02281143	0.01687645	0.01341928	0.01114537	0.00953358
	0.75	0.07251757	0.05695090	0.04699928	0.04004719	0.03490334
	1.00	0.14412581	0.11732858	0.09919667	0.08601593	0.07597989
	1.25	0.21918035	0.18250448	0.15679747	0.13762534	0.12272161
	1.50	0.28119743	0.23749679	0.20619708	0.18246603	0.16377413
	1.75	0.32322109	0.27534401	0.24062377	0.21403962	0.19293189
	2.00	0.34705400	0.29710376	0.26061457	0.23252732	0.21012682
	2.25	0.35861939	0.30770892	0.27043563	0.24167275	0.21868342
	2.50	0.36338806	0.31213278	0.27455980	0.24553531	0.22231575
	2.75	0.36509275	0.31372249	0.27605035	0.24693835	0.22364086
	3.00	0.36561722	0.31421727	0.27651644	0.24737883	0.22405833
	3.25	0.36576134	0.31435050	0.27664274	0.24749869	0.22417235
	3.50	0.36579472	0.31438220	0.27667254	0.24752700	0.22419553
	3.75	0.36580151	0.31438857	0.27667868	0.24753261	0.22420496
	4.00	0.36580294	0.31438977	0.27668017	0.24753422	0.22420639
	4.25	0.36580324	0.31438845	0.27668005	0.24753392	0.22420627
	4.50	0.36580318	0.31438994	0.27667987	0.24753404	0.22420609
	4.75	0.36580330	0.31439024	0.27668017	0.24753410	0.22420633
	5.00	0.36580205	0.31439018	0.27667993	0.24753404	0.22420627

P	X				
	1.5	2.0	3.0	4.0	5.0
0.10	0.00001572	0.00001194	0.00000806	0.00000609	0.00000489
0.25	0.00059159	0.00042609	0.00029286	0.00022310	0.00018019
0.50	0.00700563	0.00553884	0.00390492	0.00301565	0.00245642
0.75	0.02644150	0.02129211	0.01533018	0.01197895	0.00983077
1.00	0.05888421	0.04810187	0.03523127	0.02780307	0.02256451
1.25	0.09671515	0.07987714	0.05930209	0.04717706	0.03917562
1.50	0.13961094	0.10974212	0.08156091	0.06529081	0.05444588
1.75	0.18593729	0.12983257	0.09808159	0.07886564	0.06597233
2.00	0.246972369	0.14257365	0.10620186	0.08726358	0.07314301
2.25	0.317709464	0.14904937	0.11340933	0.09161764	0.07688453
2.50	0.38025577	0.15184563	0.11668397	0.09253524	0.07854158
2.75	0.418141925	0.15288264	0.11659556	0.09425907	0.07916533
3.00	0.41788500	0.153321404	0.11688162	0.09445279	0.079337407
3.25	0.418187037	0.15330571	0.11688751	0.09455872	0.07943189
3.50	0.418151475	0.15332776	0.11690587	0.09457463	0.07944586
3.75	0.418191981	0.15333241	0.11690980	0.09457809	0.07944894
4.00	0.418192071	0.15333319	0.11691040	0.09457874	0.07944942
4.25	0.418192059	0.15333325	0.11691058	0.09457874	0.07944947
4.50	0.418192077	0.15333325	0.11691052	0.09457868	0.07944942
4.75	0.418192083	0.15333331	0.11691058	0.09457880	0.07944953
5.00	0.418192083	0.15333337	0.11691058	0.09457874	0.07944959

P	X				
	6.0	7.0	8.0	9.0	10.0
0.10	0.00000408	0.00000351	0.00000307	0.00000274	0.00000246
0.25	0.00015117	0.00013013	0.00011426	0.00010184	0.00009185
0.50	0.00207216	0.00175188	0.00157835	0.00141036	0.00127467
0.75	0.00833616	0.00723616	0.00639266	0.00572535	0.00518420
1.00	0.01956151	0.01703738	0.01505047	0.01354302	0.01228351
1.25	0.03349756	0.02925841	0.02597234	0.02335026	0.02120928
1.50	0.04669604	0.04088014	0.03635385	0.03273080	0.02976489
1.75	0.05670914	0.04973115	0.04428451	0.03991448	0.03633017
2.00	0.06296778	0.05528364	0.04927404	0.04444463	0.04047846
2.25	0.06624800	0.05820379	0.05190532	0.04683506	0.04267515
2.50	0.06770664	0.05950652	0.05308225	0.04791236	0.04366158
2.75	0.06826144	0.06000355	0.05353241	0.04832372	0.04404030
3.00	0.06844312	0.06016674	0.05368057	0.04849838	0.04416542
3.25	0.06849450	0.06021306	0.05372272	0.04849803	0.04420112
3.50	0.06850713	0.06022449	0.05373313	0.04850755	0.04420591
3.75	0.06850970	0.06022684	0.05373529	0.04850559	0.04421182
4.00	0.06851017	0.06022731	0.05373571	0.04850598	0.04421221
4.25	0.06851023	0.06022737	0.05373575	0.04851104	0.04421218
4.50	0.06851017	0.06022733	0.05373575	0.04851002	0.04421221
4.75	0.06851017	0.06022735	0.05373576	0.04851002	0.04421221
5.00	0.06851029	0.06022741	0.05373575	0.04851006	0.04421223

N = 4	F	X				
		0.2	0.4	0.6	0.8	1.0
0.10	0.00000703	0.00000411	0.00000251	0.00000225	0.00000183	
0.25	0.00046195	0.00030844	0.00023170	0.00018558	0.00015479	
0.50	0.00868721	0.00649892	0.00515806	0.00433321	0.00371592	
0.75	0.04035361	0.03207676	0.02665756	0.02281941	0.01995380	
1.00	0.15229455	0.08518910	0.07260239	0.06330442	0.05614055	
1.25	0.18759924	0.15843356	0.13735682	0.12133491	0.10871339	
1.50	0.27248722	0.23372716	0.20500761	0.18276685	0.16495168	
1.75	0.34035426	0.29486030	0.26062232	0.23376495	0.21206450	
2.00	0.38479167	0.33537173	0.29784405	0.26819026	0.24408484	
2.25	0.40908861	0.35772890	0.31855106	0.28747410	0.26212865	
2.50	0.42032385	0.36814851	0.32826576	0.29657322	0.27068532	
2.75	0.42475700	0.37228593	0.33214509	0.30022466	0.27413923	
3.00	0.42623716	0.37359621	0.33347251	0.30149323	0.27532399	
3.25	0.42669827	0.37410533	0.33386357	0.30185062	0.27576714	
3.50	0.42681056	0.37423992	0.33398771	0.30194598	0.27576774	
3.75	0.42683566	0.37424529	0.33399266	0.30196708	0.27578813	
4.00	0.42683786	0.37424296	0.33399105	0.30197147	0.27579254	
4.25	0.42683852	0.37424296	0.33399055	0.30197155	0.27579236	
4.50	0.42683885	0.37424284	0.33399055	0.30197155	0.27579308	
4.75	0.42683853	0.37424326	0.33399141	0.30197197	0.27579254	
5.00	0.42683853	0.37424326	0.33399141	0.30197197	0.27579254	

P	X				
	1.5	2.0	3.0	4.0	5.0
0.10	0.00000125	0.00000095	0.00000064	0.00000049	0.00000039
0.25	0.00010943	0.00008463	0.00005824	0.00004440	0.00003587
0.50	0.00274106	0.00217181	0.00153473	0.00118672	0.00096739
0.75	0.01519488	0.01227292	0.00886660	0.00694131	0.00570326
1.00	0.04379417	0.03591667	0.02642665	0.02090822	0.01729790
1.25	0.08636224	0.07168078	0.05352883	0.04272683	0.03555714
1.50	0.13280928	0.11124184	0.08404332	0.06756288	0.05649678
1.75	0.17236555	0.14533126	0.11075163	0.08951795	0.07513499
2.00	0.19962472	0.16906291	0.12960452	0.10515606	0.08849519
2.25	0.21517164	0.18271810	0.14058781	0.11434203	0.09638935
2.50	0.22261769	0.18931001	0.14594954	0.11886060	0.10029352
2.75	0.22564590	0.19200927	0.14816695	0.12074208	0.10192809
3.00	0.22669905	0.19295388	0.14895004	0.12141097	0.10251164
3.25	0.22701389	0.19323784	0.14918751	0.12161499	0.10269040
3.50	0.22705919	0.19331175	0.14924461	0.12166870	0.10273772
3.75	0.22711243	0.19332826	0.14926362	0.12168080	0.10274839
4.00	0.22711712	0.19333160	0.14926642	0.12168312	0.10275054
4.25	0.22711867	0.19333255	0.14926690	0.12168372	0.10275078
4.50	0.22711736	0.19333291	0.14926744	0.12168407	0.10275120
4.75	0.22711754	0.19333190	0.14926666	0.12168372	0.10275090
5.00	0.22711778	0.19333220	0.14926708	0.12168413	0.10275102

F	X				
	6.0	7.0	8.0	9.0	10.0
0.10	0.00000833	0.00000028	0.00000025	0.00000022	0.00000020
0.25	0.00003009	0.00002592	0.00002276	0.00002026	0.00001839
0.50	0.00081650	0.00070633	0.00062336	0.00055692	0.00050241
0.75	0.00484011	0.00420394	0.00371560	0.00332892	0.00301515
1.00	0.01475141	0.01285875	0.01139667	0.01023322	0.00928535
1.25	0.03044982	0.02662634	0.02365640	0.02128278	0.01944221
1.50	0.04854954	0.04256514	0.03786501	0.03414897	0.03107730
1.75	0.06474203	0.05687869	0.05072064	0.04576690	0.04169540
2.00	0.07640368	0.06722492	0.06001819	0.05420876	0.04942582
2.25	0.08332449	0.07338619	0.06557012	0.05926104	0.05406097
2.50	0.08676165	0.07645607	0.06834358	0.06179039	0.05638564
2.75	0.08820617	0.07775021	0.06951565	0.06286144	0.05737175
3.00	0.08872384	0.07821536	0.06993800	0.06324810	0.05772835
3.25	0.08888298	0.07835871	0.07006842	0.06336778	0.05783889
3.50	0.08892518	0.07839680	0.07010317	0.06339967	0.05786841
3.75	0.08893478	0.07840556	0.07011122	0.06340712	0.05787529
4.00	0.08893675	0.07840729	0.07011282	0.06340855	0.05787664
4.25	0.08893710	0.07840765	0.07011300	0.06340889	0.05787689
4.50	0.08893728	0.07840776	0.07011318	0.06340891	0.05787701
4.75	0.08893698	0.07840747	0.07011306	0.06340891	0.05787696
5.00	0.08893716	0.07840765	0.07011306	0.06340879	0.05787691

N = 5	P	X				
		0.2	0.4	0.6	0.8	1.0
	0.10	0.00000058	0.00000034	0.00000024	0.00000019	0.00000015
	0.25	0.00009441	0.00006342	0.00004778	0.00003833	0.00003201
	0.50	0.00349796	0.00263584	0.00211657	0.00176884	0.00151949
	0.75	0.02392180	0.01916183	0.01599800	0.01373701	0.01203872
	1.00	0.07960975	0.06619304	0.05670725	0.04962519	0.04412822
	1.25	0.17469484	0.14884126	0.12980056	0.11514676	0.10350096
	1.50	0.29120827	0.25221467	0.22270083	0.19950294	0.18075389
	1.75	0.40102309	0.35114958	0.31272018	0.28208160	0.25702858
	2.00	0.48386610	0.42667675	0.38211763	0.34627211	0.31674039
	2.25	0.53511844	0.47387451	0.42583543	0.38698673	0.35483706
	2.50	0.56163257	0.49843538	0.44873804	0.40843892	0.37501174
	2.75	0.57317674	0.50921327	0.45884097	0.41794842	0.38399357
	3.00	0.57745945	0.51323277	0.46262753	0.42152756	0.38738716
	3.25	0.57881993	0.51451540	0.46384072	0.42267859	0.38848168
	3.50	0.57919151	0.51486766	0.46417511	0.42255670	0.38878518
	3.75	0.57927853	0.51495141	0.46425480	0.42230720	0.38885796
	4.00	0.57927990	0.51496840	0.46426952	0.42208724	0.38887310
	4.25	0.57930088	0.51497132	0.46427353	0.42209129	0.38887584
	4.50	0.57930166	0.51497197	0.46427453	0.42209177	0.38887626
	4.75	0.57930076	0.51497138	0.46427375	0.42209093	0.38887560
	5.00	0.57930118	0.51497197	0.46427423	0.42209147	0.38887602

P	X				
	1.5	2.0	3.0	4.0	5.0
0.10	0.00000010	0.00000008	0.00000005	0.00000004	0.00000003
0.25	0.00002266	0.00001754	0.00001208	0.00000892	0.00000745
0.50	0.00112383	0.00089178	0.00063122	0.00048852	0.00039845
0.75	0.00920020	0.00744667	0.00539270	0.00422729	0.00347622
1.00	0.03457750	0.02843542	0.02098882	0.01663584	0.01377522
1.25	0.08267100	0.06885308	0.05162828	0.04130744	0.03442501
1.50	0.14649159	0.12322223	0.09357548	0.07545412	0.06322169
1.75	0.21054488	0.17843097	0.13683826	0.11102176	0.09341854
2.00	0.26138717	0.22639057	0.17201060	0.14019866	0.11934794
2.25	0.29421043	0.25153130	0.19520414	0.15959930	0.13502038
2.50	0.31177074	0.26707733	0.20784944	0.17025614	0.14422941
2.75	0.31965899	0.27410907	0.21362680	0.17515898	0.14868512
3.00	0.32266229	0.27680296	0.21586043	0.17706674	0.15015256
3.25	0.32363784	0.27768296	0.21659642	0.17768891	0.15070665
3.50	0.32391030	0.27792990	0.21680427	0.17787820	0.15086478
3.75	0.32397574	0.27798921	0.21685465	0.17792249	0.15090352
4.00	0.32398975	0.27800220	0.21686566	0.17793345	0.15091187
4.25	0.32399195	0.27800304	0.21686721	0.17793345	0.15091324
4.50	0.32399237	0.27800471	0.21686765	0.17793369	0.15091342
4.75	0.32399178	0.27800399	0.21686745	0.17793363	0.15091336
5.00	0.32399166	0.27800405	0.21686727	0.17793328	0.15091318

P	X				
	6.0	7.0	8.0	9.0	10.0
0.10	0.00000003	0.00000002	0.00000002	0.00000002	0.00000002
0.25	0.00006625	0.00000538	0.00000473	0.00000421	0.00000380
0.50	0.00033643	0.00029111	0.00025656	0.00022933	0.00020733
0.75	0.00295182	0.00256493	0.00226771	0.00203223	0.00184105
1.00	0.01176023	0.01025746	0.00909532	0.00816577	0.00741521
1.25	0.02951577	0.02583037	0.02296350	0.02066963	0.01879254
1.50	0.05440603	0.04774984	0.04254574	0.03836508	0.03493284
1.75	0.08064133	0.07094258	0.06332844	0.05719146	0.05213951
2.00	0.10240233	0.09024972	0.08067906	0.07294554	0.06656629
2.25	0.11702013	0.10322638	0.09240627	0.08361763	0.07635736
2.50	0.12512749	0.11050498	0.09854866	0.08958405	0.08184105
2.75	0.12888885	0.11387491	0.10200095	0.09237349	0.08440930
3.00	0.13036776	0.11520356	0.10320705	0.09347785	0.08542764
3.25	0.13086098	0.11564803	0.10361165	0.09384894	0.08577043
3.50	0.13100213	0.11577541	0.10372776	0.09395576	0.08586525
3.75	0.13103706	0.11580694	0.10375643	0.09398216	0.08589381
4.00	0.13104439	0.11581367	0.10376265	0.09398782	0.08589500
4.25	0.13104576	0.11581492	0.10376376	0.09398878	0.08589589
4.50	0.13104588	0.11581510	0.10376400	0.09398886	0.08590007
4.75	0.13104588	0.11581498	0.10376394	0.09398896	0.08590001
5.00	0.13104564	0.11581492	0.10376382	0.09398878	0.08589589

N = 6	P	X				
		0.2	0.4	0.6	0.8	1.0
0.10	0.00000005	0.00000003	0.00000002	0.00000002	0.00000001	
0.25	0.00001995	0.00001346	0.00001016	0.00000816	0.00000682	
0.50	0.00146190	0.00110716	0.00089155	0.00074642	0.00064201	
0.75	0.01478853	0.01190816	0.00997410	0.00858329	0.00753416	
1.00	0.06437927	0.05382412	0.04627702	0.04060124	0.03617315	
1.25	0.17205834	0.14746082	0.12911685	0.11487997	0.10349602	
1.50	0.33241856	0.28977442	0.25703961	0.23105770	0.20990610	
1.75	0.51046044	0.45020503	0.40303284	0.36499965	0.33363593	
2.00	0.66512263	0.59122515	0.53262430	0.48487729	0.44515526	
2.25	0.77348346	0.69096303	0.62501192	0.57092375	0.52567565	
2.50	0.83597219	0.74892330	0.67905575	0.62154734	0.57328647	
2.75	0.86605680	0.77700663	0.70538729	0.64633310	0.59669769	
3.00	0.87827456	0.78847808	0.71618986	0.65654439	0.606637915	
3.25	0.88249296	0.79245043	0.71995223	0.66011399	0.60977459	
3.50	0.88373792	0.79362905	0.72107095	0.66117865	0.61079001	
3.75	0.88405347	0.79392898	0.72135663	0.66145122	0.61105114	
4.00	0.88412237	0.79399514	0.72141981	0.66151184	0.61110902	
4.25	0.88413602	0.79400736	0.72143179	0.66152316	0.61112064	
4.50	0.88413811	0.79400927	0.72143370	0.66152513	0.61112189	
4.75	0.88413805	0.79400724	0.72143406	0.66152495	0.61112189	
5.00	0.88413638	0.79400820	0.72143245	0.66152400	0.61112076	

P	X				
	1.5	2.0	3.0	4.0	5.0
0.10	0.00000001	0.00000001	0.00000000	0.00000000	0.00000000
0.25	0.00000483	0.00000374	0.00000258	0.00000197	0.00000159
0.50	0.000047575	0.000037794	0.000026784	0.000020742	0.000016925
0.75	0.00577258	0.00467953	0.00339475	0.00266870	0.00219179
1.00	0.02843509	0.02343050	0.01733488	0.01375794	0.01140525
1.25	0.08299029	0.06929106	0.05211242	0.04176748	0.03485227
1.50	0.17092258	0.14421576	0.10993356	0.08884370	0.07455152
1.75	0.27484733	0.23380280	0.18014944	0.14657730	0.12357134
2.00	0.36981487	0.31649846	0.24586385	0.20109701	0.17015598
2.25	0.43919706	0.37745023	0.29490000	0.24211562	0.20544012
2.50	0.48064190	0.41414350	0.32474565	0.26727319	0.22715062
2.75	0.50120014	0.43247151	0.33981019	0.28005493	0.23825246
3.00	0.50976145	0.44016033	0.34618461	0.28549629	0.24300172
3.25	0.51279896	0.44288975	0.34846675	0.28745985	0.24472219
3.50	0.51311002	0.44371575	0.34916258	0.28806096	0.24525130
3.75	0.513394528	0.44392997	0.34934443	0.28821874	0.24539065
4.00	0.513599779	0.44397801	0.34938550	0.28825444	0.24542242
4.25	0.51400810	0.44398743	0.34939313	0.28826141	0.24542868
4.50	0.51400948	0.44398880	0.34939474	0.28826267	0.24542964
4.75	0.51400971	0.44398874	0.34939468	0.28826249	0.24542981
5.00	0.51400870	0.44398880	0.34939486	0.28826290	0.24542699

P	X				
	6.0	7.0	8.0	9.0	10.0
0.10	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
0.25	0.00000134	0.00000115	0.00000101	0.00000090	0.00000081
0.50	0.00014294	0.00012371	0.00010905	0.00009749	0.00008815
0.75	0.00186195	0.00161841	0.00143122	0.00128284	0.00116234
1.00	0.00973954	0.00849909	0.00753873	0.00677341	0.00614517
1.25	0.02990271	0.02618469	0.02328927	0.02097060	0.01907191
1.50	0.06422400	0.05641136	0.05029425	0.04537451	0.04133179
1.75	0.10681570	0.09406549	0.08403677	0.07594150	0.06926972
2.00	0.14748126	0.13014728	0.11646307	0.10538524	0.09623313
2.25	0.17839211	0.15766692	0.14126283	0.12795419	0.11693937
2.50	0.19753259	0.17476314	0.15670925	0.14204121	0.12988704
2.75	0.20734507	0.18355459	0.16467196	0.14931786	0.13658661
3.00	0.21155816	0.18734127	0.16810971	0.15246546	0.13548541
3.25	0.21308929	0.18871965	0.16936374	0.15361619	0.14088309
3.50	0.21356195	0.18914670	0.16975325	0.15397988	0.14097190
3.75	0.21368688	0.18925971	0.16985643	0.15406907	0.14097190
4.00	0.21371531	0.18928564	0.16988009	0.15409048	0.14096157
4.25	0.21372086	0.18929052	0.16988474	0.15409489	0.14095950
4.50	0.21372175	0.18929130	0.16988552	0.15409577	0.14096034
4.75	0.21372199	0.18929154	0.16988565	0.15409607	0.14096049
5.00	0.21372187	0.18929148	0.16988581	0.15409625	0.1409652

N = 7	P	X				
		0.2	0.4	0.6	0.8	1.0
	0.10	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
	0.25	0.00000432	0.00000292	0.00000221	0.00000178	0.00000149
	0.50	0.00062739	0.00047690	0.00038484	0.00032263	0.00027776
	0.75	0.00941758	0.00761203	0.00639083	0.00550866	0.00484112
	1.00	0.05385637	0.04520261	0.03856606	0.0325127	0.03055509
	1.25	0.11623360	0.15171111	0.13322526	0.11879152	0.10719925
	1.50	0.37753114	0.34816706	0.30985278	0.27923030	0.25417006
	1.75	0.68681711	0.60682682	0.54708970	0.49690968	0.45527303
	2.00	0.97598702	0.87252140	0.78943676	0.72110987	0.66385591
	2.25	1.20521641	1.08352852	0.98490703	0.90317512	0.83423799
	2.50	1.35279274	1.22041798	1.11255495	1.02274490	0.94670117
	2.75	1.43125057	1.29361826	1.18122299	1.08740711	1.00776291
	3.00	1.466612835	1.32639408	1.21206895	1.11654758	1.03540325
	3.25	1.47920990	1.33872795	1.22736766	1.12761784	1.04593372
	3.50	1.48338032	1.34276191	1.22748566	1.13118485	1.04933643
	3.75	1.48450375	1.34375477	1.22851181	1.13118485	1.05027390
	4.00	1.48478127	1.34400749	1.22875404	1.13239670	1.05049610
	4.25	1.48483276	1.34405804	1.22880268	1.13244343	1.05054092
	4.50	1.48484135	1.34406567	1.22880936	1.13245010	1.05054760
	4.75	1.48484325	1.34406662	1.22881031	1.13245010	1.05054855
	5.00	1.48484802	1.34407043	1.22881603	1.13245583	1.05055332

P	X					
	1.5	2.0	3.0	4.0	5.0	
	0.10	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
	0.25	0.00000105	0.00000082	0.00000056	0.00000043	0.00000035
	0.50	0.00020614	0.00016389	0.00011626	0.00009008	0.00007352
	0.75	0.00371641	0.00301621	0.00219103	0.00172048	0.00141634
	1.00	0.02407959	0.01987123	0.01472757	0.01170946	0.00970572
	1.25	0.08620965	0.07211322	0.05435798	0.04362511	0.03643404
	1.50	0.20769250	0.17564517	0.13427585	0.10870200	0.09131514
	1.75	0.37663805	0.32130295	0.24845546	0.20259553	0.17105156
	2.00	0.55428863	0.47601378	0.37141937	0.30462217	0.25823063
	2.25	0.70111769	0.60501271	0.47521240	0.39145052	0.33286172
	2.50	0.79902381	0.69169909	0.54573667	0.45089275	0.38423210
	2.75	0.85255619	0.73951381	0.58502805	0.48424041	0.41319788
	3.00	0.87712336	0.76146203	0.60322827	0.49978572	0.42676473
	3.25	0.89650978	0.76992828	0.61030728	0.50588649	0.43209678
	3.50	0.89956165	0.77269495	0.61263317	0.50788242	0.43386530
	3.75	0.89940720	0.77346486	0.61329144	0.50844949	0.43437070
	4.00	0.8990875	0.77364916	0.61344892	0.50858670	0.43449223
	4.25	0.89906496	0.77368689	0.61348110	0.50861508	0.43451750
	4.50	0.89906568	0.77369366	0.61348712	0.50862032	0.43452209
	4.75	0.89906577	0.77369469	0.61348784	0.50862080	0.43452293
	5.00	0.899065820	0.77369453	0.61348832	0.50862110	0.43452275

P	X					
	6.0	7.0	8.0	9.0	10.0	
	0.10	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
	0.25	0.00000025	0.00000025	0.00000022	0.00000020	0.00000018
	0.50	0.00006211	0.00005376	0.00004735	0.00004237	0.00003832
	0.75	0.00120360	0.00104642	0.00092556	0.00082973	0.00075188
	1.00	0.00829257	0.00723857	0.00642233	0.00577154	0.00524051
	1.25	0.03127913	0.02740255	0.02438114	0.02195999	0.01997633
	1.50	0.07873291	0.06919742	0.06172306	0.05570652	0.05075901
	1.75	0.14801395	0.13044983	0.11661446	0.10543394	0.09621048
	2.00	0.22412074	0.19797981	0.17730510	0.16054314	0.146667851
	2.25	0.28955919	0.25624233	0.22980576	0.20832574	0.19051838
	2.50	0.33486677	0.29664010	0.26631027	0.24161440	0.22111487
	2.75	0.36038971	0.31957906	0.28708720	0.26060212	0.23859680
	3.00	0.37242496	0.33039349	0.29690516	0.26959223	0.24688774
	3.25	0.37717098	0.33467001	0.30074681	0.27316219	0.25018519
	3.50	0.37875408	0.33609974	0.30210072	0.27436060	0.25129384
	3.75	0.37920320	0.33650458	0.30247225	0.27470243	0.25161105
	4.00	0.37931257	0.33660567	0.30256313	0.27478629	0.25168836
	4.25	0.37933534	0.33662641	0.30258220	0.27480394	0.25170475
	4.50	0.37933946	0.33663034	0.30258554	0.27480704	0.25170773
	4.75	0.37934017	0.33663088	0.30258632	0.27480757	0.25170827
	5.00	0.37934017	0.33663076	0.30258644	0.27480763	0.25170827

N = 8	P	X				
		0.2	0.4	0.6	0.8	1.0
0.10	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
0.25	0.00000095	0.00000065	0.00000049	0.00000039	0.00000033	0.00000033
0.50	0.00027463	0.00020935	0.00016921	0.00014200	0.00012232	0.00012232
0.75	0.00613066	0.00496937	0.00417968	0.00360725	0.00317305	0.00317305
1.00	0.04619315	0.03888338	0.03358483	0.02956345	0.02640533	0.02640533
1.25	0.18593347	0.16050583	0.14125508	0.12615705	0.11399096	0.11399096
1.50	0.49218148	0.43243325	0.38578838	0.34831572	0.31752556	0.31752556
1.75	0.96293914	0.85677195	0.77204825	0.70277202	0.64502817	0.64502817
2.00	1.50438595	1.35057640	1.22592228	1.12269592	1.03572750	1.03572750
2.25	1.98986626	1.79749966	1.63592601	1.50836945	1.39667034	1.39667034
2.50	2.33868885	2.12208040	1.94171425	1.79104710	1.66254711	1.66254711
2.75	2.54376120	2.31225109	2.12097740	1.95976577	1.82195091	1.82195091
3.00	2.64376120	2.40575790	2.190907307	2.04307365	1.90090847	1.90090847
3.25	2.68368146	2.40403076	2.24528313	2.07743454	1.93359375	1.93359375
3.50	2.69765377	2.45726013	2.25783920	2.08938313	1.94465302	1.94465302
3.75	2.70173645	2.46113682	2.26153374	2.09290791	1.94836521	1.94836521
4.00	2.70275497	2.46210957	2.26245975	2.09379387	1.94921303	1.94921303
4.25	2.70297718	2.46231842	2.26266003	2.09398651	1.94939804	1.94939804
4.50	2.70301723	2.46236038	2.26269913	2.09402466	1.94943523	1.94943523
4.75	2.70302391	2.46236324	2.26270350	2.09402752	1.94944000	1.94944000
5.00	2.70302677	2.46236801	2.26270560	2.09403038	1.94944191	1.94944191

P	X				
	1.5	2.0	3.0	4.0	5.0
0.10	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
0.25	0.00000023	0.00000018	0.00000012	0.00000010	0.00000008
0.50	0.00009090	0.00007232	0.00005134	0.00003979	0.00003249
0.75	0.00243956	0.00198174	0.00144108	0.00113226	0.00093245
1.00	0.02084504	0.01722197	0.01278165	0.01016260	0.00843459
1.25	0.09187567	0.07696360	0.05811632	0.04668584	0.03902020
1.50	0.26016110	0.22040945	0.16887154	0.13689172	0.11510348
1.75	0.53534466	0.45769477	0.35492015	0.28990346	0.24504340
2.00	0.80815269	0.74755841	0.58532935	0.48105961	0.40843362
2.25	1.17923260	1.02088547	0.80527204	0.66510701	0.56660044
2.50	1.41071415	1.225885201	0.97204173	0.80568057	0.68809104
2.75	1.55072975	1.35068798	1.07463074	0.89275944	0.76373023
3.00	1.620693122	1.41339207	1.12663174	0.93717265	0.80249196
3.25	1.64976311	1.43967056	1.14866039	0.95605260	0.81904268
3.50	1.65998745	1.44893932	1.15641403	0.96280009	0.82498181
3.75	1.66303062	1.45171070	1.15876484	0.96484202	0.82678646
4.00	1.66380024	1.45241737	1.15936852	0.96536869	0.82725376
4.25	1.66396809	1.45256901	1.15944917	0.96548223	0.82735491
4.50	1.66409956	1.45259593	1.15952356	0.96550453	0.82737440
4.75	1.664300337	1.45260429	1.15952969	0.96550977	0.82737941
5.00	1.66400719	1.45260334	1.15952873	0.96551073	0.82738024

P	X				
	6.0	7.0	8.0	9.0	10.0
0.10	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
0.25	0.00000006	0.00000006	0.00000005	0.00000004	0.00000004
0.50	0.00002745	0.00002376	0.00002095	0.00001873	0.00001694
0.75	0.00079260	0.00068923	0.00060971	0.00054664	0.00049540
1.00	0.00720895	0.00629437	0.00558575	0.00502055	0.00455523
1.25	0.03351561	0.02937248	0.02614115	0.02355050	0.02142708
1.50	0.09930241	0.08731771	0.07751519	0.07034129	0.06410568
1.75	0.21221793	0.18715193	0.16738498	0.15189627	0.13819629
2.00	0.35486263	0.31372744	0.28114474	0.25469714	0.23279529
2.25	0.49355352	0.43721300	0.39243007	0.35597616	0.32572359
2.50	0.60052311	0.53276247	0.47876275	0.43471372	0.39809442
2.75	0.66737998	0.59266347	0.53301972	0.48429811	0.44374728
3.00	0.70176572	0.62356216	0.56107277	0.50998586	0.46743774
3.25	0.71649873	0.63683730	0.57315207	0.52106750	0.47767353
3.50	0.72130313	0.64162892	0.57752198	0.52508324	0.48138893
3.75	0.72341955	0.64309275	0.57885939	0.52631521	0.48253018
4.00	0.72393916	0.64347410	0.57920843	0.52663672	0.48282784
4.25	0.72393209	0.64355856	0.57928592	0.52670819	0.48289496
4.50	0.72394812	0.64357316	0.57929545	0.52672076	0.48290652
4.75	0.72395271	0.64357704	0.57930315	0.52672434	0.48290992
5.00	0.72395331	0.64357769	0.57930368	0.52672458	0.48290998

N = 9	P	X				
		0.2	0.4	0.6	0.8	1.0
0.10	0.000000000	0.000000000	0.000000000	0.000000000	0.000000000	0.000000000
0.25	0.000000021	0.000000014	0.000000011	0.000000009	0.000000007	0.000000007
0.50	0.000122021	0.000093226	0.000075547	0.000063399	0.000054655	0.000047565
0.75	0.004059020	0.003297400	0.002777350	0.002399355	0.002112100	0.001912100
1.00	0.040384588	0.034069885	0.030472232	0.025972470	0.023217899	0.021217899
1.25	0.200495224	0.173479800	0.152929011	0.136756488	0.123691020	0.113691020
1.50	0.625411030	0.550874230	0.492374660	0.445195020	0.406317590	0.376317590
1.75	1.393132211	1.243011470	1.122490888	1.023500444	0.940691050	0.876391050
2.00	2.408460662	2.169106648	1.973782544	1.811178221	1.673605920	1.556305920
2.25	3.437795644	3.116769799	2.851800952	2.629088554	2.439108885	2.286308885
2.50	4.263073920	3.882380499	3.565785410	3.297977459	3.068264960	2.868264960
2.75	4.979794121	4.381718664	4.034031870	3.738781193	3.484664692	3.284664692
3.00	5.082669226	4.648984910	4.285843855	3.976828588	3.710376740	3.510376740
3.25	5.208695410	4.767826608	4.398226584	4.083492228	3.811848640	3.611848640
3.50	5.255519887	4.812145230	4.440346672	4.123545655	3.850056655	3.650056655
3.75	5.270215030	4.826108930	4.453644750	4.136238100	3.862196920	3.662196920
4.00	5.274148894	4.829854010	4.457221030	4.139656607	3.865474750	3.665474750
4.25	5.275038872	4.830706660	4.458037388	4.140444189	3.866225066	3.666225066
4.50	5.275213244	4.830871588	4.458155565	4.140596639	3.866376888	3.666376888
4.75	5.275226599	4.830884930	4.458209044	4.140608790	3.866391188	3.666391188
5.00	5.275244771	4.830904010	4.458226811	4.140625000	3.866407399	3.666407399

P	X				
	1.5	2.0	3.0	4.0	5.0
0.10	0.000000000	0.000000000	0.000000000	0.000000000	0.000000000
0.25	0.000000005	0.000000004	0.000000003	0.000000002	0.000000002
0.50	0.000040664	0.000032335	0.000022998	0.000017820	0.000014555
0.75	0.001825810	0.001321688	0.000961151	0.000756130	0.000622889
1.00	0.018355663	0.015179288	0.011278111	0.008972822	0.007450222
1.25	0.059868836	0.053754660	0.043332886	0.035922885	0.042581210
1.50	0.333605533	0.283028300	0.217231395	0.176280226	0.148328878
1.75	0.782702774	0.670329557	0.520595856	0.426610532	0.360501830
2.00	1.407105455	1.214218140	0.953335050	0.784942887	0.667173374
2.25	2.066928886	1.794010160	1.419966002	1.175348288	1.002773288
2.50	2.614740337	2.279094700	1.814675333	1.508082239	1.290350910
2.75	2.980524036	2.605246540	2.082728399	1.735606199	1.487991333
3.00	3.180342667	2.784502998	2.231394717	1.862599317	1.598830222
3.25	3.270797773	2.866102222	2.299628226	1.921223127	1.650230410
3.50	3.305069922	2.897117102	2.325807577	1.943849956	1.670135310
3.75	3.316017115	2.907142640	2.334427143	1.951199953	1.676631930
4.00	3.318993547	2.909862252	2.336568866	1.953222323	1.678429600
4.25	3.319675555	2.910492500	2.337129599	1.953659911	1.678853999
4.50	3.319809910	2.910615920	2.337237346	1.953792570	1.678936960
4.75	3.319837570	2.910636900	2.337255488	1.953806688	1.678951260
5.00	3.319839448	2.910628320	2.337246689	1.953801116	1.678944599

P	X				
	6.0	7.0	8.0	9.0	10.0
0.10	0.000000000	0.000000000	0.000000000	0.000000000	0.000000000
0.25	0.000000001	0.000000001	0.000000001	0.000000001	0.000000001
0.50	0.000012300	0.000010655	0.000009535	0.000008399	0.000007599
0.75	0.000529570	0.000460588	0.000407450	0.000365370	0.000331115
1.00	0.006369488	0.005562660	0.004937188	0.004438200	0.004030882
1.25	0.036588466	0.032074795	0.028552664	0.025727660	0.023411333
1.50	0.128031970	0.112623116	0.100525668	0.090775730	0.082750020
1.75	0.312416730	0.275655887	0.246638872	0.223150730	0.203748700
2.00	0.580166100	0.513250470	0.460183774	0.417067665	0.381341930
2.25	0.874454266	0.775283588	0.696334000	0.631989366	0.578536683
2.50	1.127667430	1.001470507	0.900707540	0.818339596	0.749863998
2.75	1.302368116	1.157999040	1.042490010	0.947961277	0.869167570
3.00	1.400695800	1.287582400	1.122710230	1.021417620	0.936913070
3.25	1.446451119	1.246356010	1.160225870	1.055834770	0.968704040
3.50	1.464230544	1.303647960	1.174975260	1.069298740	0.981159210
3.75	1.470048900	1.308915140	1.179688450	1.073730470	0.985265430
4.00	1.471662520	1.310376988	1.181030210	1.074967388	0.986412588
4.25	1.472043599	1.310727120	1.181347885	1.075261120	0.986685220
4.50	1.472120225	1.310796774	1.181412700	1.075330224	0.986741130
4.75	1.472132668	1.310809140	1.181423190	1.075330773	0.986750225
5.00	1.472134559	1.310810050	1.181425050	1.075331699	0.986751885

N = 10	P	X				
		0.2	0.4	0.6	0.8	1.0
0.10	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
0.25	0.00000005	0.00000003	0.00000003	0.00000002	0.00000002	0.00000002
0.50	0.00005493	0.00004204	0.00003406	0.00002862	0.00002469	0.00002134
0.75	0.000272363	0.000221648	0.000164903	0.00011595	0.00007334	0.000042334
1.00	0.03584117	0.03029019	0.02623474	0.02314016	0.02070025	0.0183306
1.25	0.21997249	0.19067973	0.16831416	0.15066642	0.13638043	0.12465144
1.50	0.81108451	0.71582013	0.64074504	0.58001363	0.52985144	0.48434578
1.75	2.06551933	1.84694059	1.67065334	1.52534580	1.40345478	1.29834306
2.00	3.9725761	3.58630848	3.26968002	3.00500870	2.78034306	2.5958214
2.25	6.15727425	5.59811974	5.13375378	4.74156761	4.40747452	4.12465144
2.50	8.11154556	7.41120720	6.82468891	6.32577801	5.89589214	5.52985144
2.75	9.50955105	8.71644688	8.04871368	7.47810841	6.98445988	6.5958214
3.00	10.3238468	9.48078346	8.76886654	8.15891361	7.62996630	7.29834306
3.25	10.7153769	9.84998512	9.11815262	8.49032021	7.94526577	7.62996630
3.50	10.9223373	9.99858185	9.25923347	8.62460613	8.07338142	7.79526577
3.75	10.9252405	10.0488491	9.30710506	8.67029858	8.11709118	7.8338142
4.00	10.9403439	10.0632334	9.32084274	8.68344307	8.12968922	7.8526577
4.25	10.9440088	10.0667448	9.32420731	8.68667412	8.13278770	7.8578577
4.50	10.9447689	10.0674582	9.32488823	8.68733406	8.13354301	7.8582142
4.75	10.9449053	10.0675898	9.32502365	8.68745136	8.13354301	7.8582142
5.00	10.9449253	10.0676107	9.32503891	8.68747139	8.13356209	7.8582142

P	X				
	1.5	2.0	3.0	4.0	5.0
0.10	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
0.25	0.00000001	0.00000001	0.00000001	0.00000000	0.00000000
0.50	0.00001837	0.00001463	0.00001040	0.00000807	0.00000659
0.75	0.00109671	0.00089209	0.00064971	0.00051052	0.00042099
1.00	0.01638466	0.01355956	0.01008376	0.00802679	0.00666700
1.25	0.11026883	0.09256208	0.07007289	0.05638000	0.04716545
1.50	0.43576062	0.37011248	0.28447515	0.23104733	0.19452399
1.75	1.17009163	1.00348663	0.78126519	0.63972402	0.54163730
2.00	2.34329033	2.02551270	1.59389687	1.31417847	1.11808205
2.25	3.74443817	3.25681114	2.58494759	2.14340225	1.83096581
2.50	5.04204464	4.40594006	3.52008915	2.93178940	2.51236153
2.75	5.99827862	5.25857639	4.22089005	3.52665806	3.07916241
3.00	6.56989861	5.77140427	4.64622402	3.89000702	3.34625816
3.25	6.85079098	6.02478409	4.85811424	4.07207966	3.50587749
3.50	6.96583557	6.12909508	4.94601059	4.14796829	3.57273293
3.75	7.00525856	6.16499805	4.97647381	4.17448711	3.59611797
4.00	7.01667786	6.17543983	4.98539543	4.18227196	3.60301971
4.25	7.01950073	6.17802620	4.98762222	4.18422508	3.60437349
4.50	7.02008724	6.17857552	4.98808861	4.18463612	3.60512257
4.75	7.02019310	6.17867279	4.98817444	4.18470860	3.60518837
5.00	7.02020931	6.17868614	4.98818588	4.18472250	3.60520077

P	X				
	6.0	7.0	8.0	9.0	10.0
0.10	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
0.25	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
0.50	0.00000557	0.00000482	0.00000425	0.00000380	0.00000344
0.75	0.00035799	0.00031138	0.00027552	0.00024706	0.00022394
1.00	0.00570123	0.00497985	0.00442060	0.00397426	0.00360979
1.25	0.04054044	0.03554776	0.03165009	0.02852279	0.02595799
1.50	0.16797590	0.14780605	0.13196182	0.11518616	0.10866618
1.75	0.46964645	0.41455531	0.37103641	0.33578902	0.30665886
2.00	0.97295594	0.86115837	0.77248216	0.70034426	0.64053357
2.25	1.59811306	1.41785336	1.27416611	1.15693760	1.05947495
2.50	2.19810390	1.95381832	1.75845337	1.59863567	1.46546745
2.75	2.65492630	2.36313629	2.12921810	1.93748474	1.77746105
3.00	2.93624456	2.61593056	2.35873699	2.14765549	1.97129250
3.25	3.07833672	2.74396515	2.47524643	2.25459862	2.07007790
3.50	3.13804436	2.79784298	2.52437552	2.29969311	2.11179256
3.75	3.15890886	2.81680023	2.54177380	2.31571293	2.12663555
4.00	3.16519260	2.82251358	2.54693222	2.32046586	2.13104916
4.25	3.16675854	2.82342883	2.54822922	2.32166862	2.13216305
4.50	3.16708851	2.82423306	2.54851151	2.32192707	2.13240623
4.75	3.16714764	2.82428932	2.54856014	2.32197666	2.13244820
5.00	3.16716003	2.82429695	2.54857159	2.32198238	2.13245487