Chemistry 236 -- Quiz 5

Lab Day ____

October 3, 2007 — Probability Distributions and Confidence Intervals

Pledge and signature:

Note: If you want your paper returned folded (*i.e.*, score concealed), please print your name on the back.

1. (10) Consider the *uniform distribution* over the range $1 \le x \le 3$. For this distribution, calculate: (a) the normalization constant, (b) the mean, (c) the median, (d) the variance, and (e) the probability of getting a value in the range 2.4 – 2.8.

   (a) 1/2 (b) 2 (c) 2 (d) 1/3 (e) 0.20

2. (3) If you generate 10^5 random numbers using this distribution, how many would you expect to fall within the range 1.0–1.1? What is the standard deviation of this value?

   5000 and $5000^{1/2}$

3. (3) You now generate 10^5 *averages* of 25 such random numbers. Use the accompanying table to estimate how many of these would fall between 1.9 and 2.1.

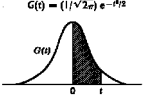
   $\sigma/25^{1/2} = 1/75^{1/2} = 0.11547$

   $\pm 0.1 = \pm 0.866\ \sigma$

   interpolation --> 0.3066

   $\times 2 \times 10^5 = 61{,}300$

Table 4-4. Error Function $\frac{1}{2}$ erf (t) from 0 to t and Ordinate Values
$G(t) = (1/\sqrt{2\pi})\, e^{-t^2/2}$



t	½ erf (t) Area	G(t) Ordinate	t	½ erf (t) Area	G(t) Ordinate
0	0	0.3989	2.0	0.4773	0.0540
0.1	0.0398	0.3970	2.1	0.4821	0.0440
0.2	0.0793	0.3910	2.2	0.4861	0.0355
0.3	0.1179	0.3814	2.3	0.4893	0.0283
0.4	0.1554	0.3683	2.4	0.4918	0.0224
0.5	0.1915	0.3521	2.5	0.4938	0.0175
0.6	0.2258	0.3332	2.6	0.4953	0.0136
0.7	0.2580	0.3123	2.7	0.4965	0.0104
0.8	0.2881	0.2897	2.8	0.4974	0.0079
0.9	0.3159	0.2661	2.9	0.4981	0.0060
1.0	0.3413	0.2420	3.0	0.4987	0.0044
1.1	0.3643	0.2179	3.1	0.4990	0.0033
1.2	0.3849	0.1942	3.2	0.4993	0.0024
1.3	0.4032	0.1714	3.3	0.4995	0.0017
1.4	0.4192	0.1497	3.4	0.4997	0.0012
1.5	0.4332	0.1295	3.5	0.4998	0.0009
1.6	0.4452	0.1109	3.6	0.4998	0.0006
1.7	0.4554	0.0941	3.8	0.4999	0.0003
1.8	0.4641	0.0790	4.0	0.5000	0.0001
1.9	0.4713	0.0656	4.4	0.5000	0.0000