Extra Math 100 HW on Prob/Stat
(Part B)

1. In each of the following problems, a table gives the probability distribution function for a discrete random variable X. Compute the mean and variance of X in each case.

   (a)

x	-2	1	3
P(X=x)	1/4	1/2	1/4

   (b)

x	0	1	2	3	4	5
P(X=x)	.1	.1	.2	.2	.1	A

   (Note that on this one you first have to figure out what A is!)

2. An unfair coin with a probability 0.25 of heads is flipped 72 times; what is the expected number of heads?

3. In the last problem, suppose each time you get a head you get paid \$5, but each time you get a tail you have to pay \$1; how much money do you expect to earn?

4. An ordinary die is rolled once; what is $E(X^3)$, where X is the number that appears?

5. An ordinary die is rolled 36 times; what is the expected number of times the number rolled will be a 5 or 6?

6. Suppose X, Y, and Z are independent random variables with means and variances: $E(X) = 1, E(Y) = -2, E(Z) = 3, Var(X) = 4, Var(Y) = 1, Var(Z) = 9$
   (a) What are the standard deviations of X, Y, and Z?
   (b) What are the mean, variance, and standard deviation of $X + Y$, $5Y$, $2X + Y + 2Z$, and $X - Y$?

7. In a class of 49 students, the heights $x_1, x_2, \ldots, x_49$ in inches are measured, and we compute that $\bar{x} = 68, s^2 = 4$.
   (a) Find a 95% confidence interval for the height.
   (b) Find a 99% confidence interval for the height.
   (c) What have you actually found? In other words, what conceptual assumptions have you made about what the data represents, and what is supposed to lie in this confidence interval 95% of the time?

8. In problem 2 above, get a 90% confidence interval for the true probability of getting heads.

9. $\int_0^\infty \frac{1}{\sqrt{2\pi}} e^{-x^2/2} dx = ?$

10. Draw pictures representing the following integrals:
    1. $\int_0^1 x^2 dx$
    2. $\int_1^\infty x^2 dx$