Workshop #8 (November 20^{th}, 2008)

Note: TURN IN YOUR MAPLE WORK.

$$\text{Normal Distribution :} \qquad n(x) = \frac{1}{\sqrt{2\pi\sigma^2}} e^{-\frac{1}{2\sigma^2}(x-\mu)^2}$$

1. Let $r(t)$ be the rate of repair costs for our car t years after we purchased it. In other words, $r(1) = \$150$ means that after 1 year has past we are paying for repairs at a rate of \$150 per year. So if we want to determine our total repair costs over the first year and a half, we would need to compute the definite integral: $\int_0^{1.5} r(t)\,dt$.

   Suppose that we've recorded the following information about our repairs:

Years owned $t =$	0	0.5	1	1.5
Repair cost rate $r(t) =$	\$5	\$100	\$150	\$175

   Use a right hand sum (and $n = 3$ rectangles) to estimate the total cost of repairing our car for the first year and a half. **SHOW YOUR WORK!**

2. Jim just developed a great new mp3 player which he likes to call the "jPod". The jPod's sales rate is characterized by the function $S(t) = 5t^2(t-5)^2 \exp(-t^2/10)$ where $S(t)$ represents *thousands* of jPods sold per year t years after its release [For example: $S(1) = 72.38699344$ so after 1 year Jim is selling jPods at a rate of about 72,387 jPods per year.]

   (a) Plot the sales rate $S(t)$ for the first 10 years.

   (b) When is the sales rate equal to zero? [Hint: there are 2 solutions.]

   (c) When does the jPod hit its maximum sales rate? Also, what is that rate?

   (d) How many jPods are sold during the first three months?

   (e) How many jPods are sold in total (over all time)?

   (f) How many years go by until half of the total number of jPods have been sold?

   (g) When will only 5,000 jPods remain to be sold?

3. The mayor of Bigfoot Falls has found that his citizen's average shoe size is 15. In addition, shoe sizes seem to distributed according to the normal distribution with a standard deviation of 3.
   Note: Shoe sizes go in increments of 1/2.

   (a) What percentage of Bigfoot Falls' population wears a size 16 shoe?

   (b) What percentage of the population wears a size 13 shoe or smaller?

   (c) If the mayor wants to provide shoes for the "middle" 50% of his citizens, what shoe sizes will he need to order?
   [*Hint:* First, find the size X so that the probability of having a shoe size 15 to X is 0.25. This will give the upper half of the "middle".]