Calc I - Review for exam III

The third exam will be next Wednesday, November 10. Here are some problems that might help.

1. Find the absolute maximum and absolute minimum values of $f(x) = x^3 - 12x + 1$ on $[0, 3]$.
2. Let $f(x) = xe^{-x^2}$. A graph of f is shown in figure 2.
   (a) Find the exact locations of the absolute maximum and minimum of f.
   (b) Find the exact locations of the inflection points of f,
3. Let $f(x) = x^3 - 5$.
   (a) Find the corresponding Newton's method iteration function $N(x)$.
   (b) Perform two Newton iteration steps from the initial point $x_1 = 1$.
4. Suppose the volume of a sphere changes at the rate of 4 cubic centimeters per second. At what rate is the radius of the sphere increasing when it's 5 centimeters?
5. Suppose I pull the bottom of a 10 foot tall ladder away from a wall at the rate of 2 feet per second. At what rate is the top of the ladder moving towards the floor when it is 3 feet away from the floor?
6. Suppose I set up a rectangular corral to enclose 4000 square feet with three inner partitions breaking the corral into four pieces, as shown in figure 1. The material for the exterior portion costs three times as much as the material for the interior walls. What are the dimensions of the cheapest such corral?
7. Suppose I have 7000 feet of fence to set up a rectangular corral with three inner partitions breaking the corral into four pieces, as shown in figure 1. What is the maximum area that I can enclose?
8. The velocity of an object is given by $v(t) = 2t - 1$ and, at time zero, the position of the object is $p_0 = 1$. Find the position $p(t)$ of the object as a function of time.
9. Two poles are connected by a wire that is also connected to the ground. The first pole is 20ft tall and the second pole is 10ft tall. There is a distance of 30ft between the two poles. Where should the wire be anchored to the ground to minimize the amount of wire needed?

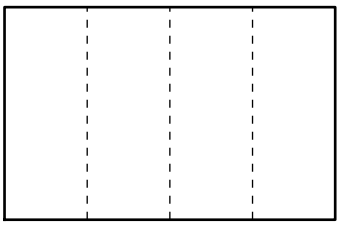

Figure 1: A partitioned corral

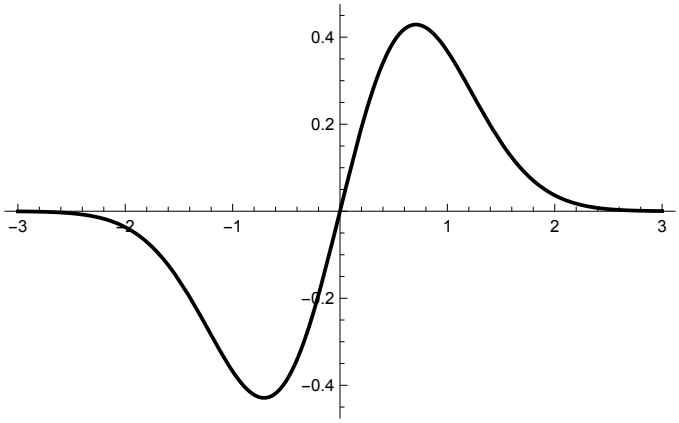

Figure 2: The graph of $f(x) = xe^{-x^2}$