Calc I - Review for exam III

The third exam will be next Tuesday, November 19. Here are some problems that might help.

1. Use a linear approximation to find a good estimate to $\sqrt[3]{8.8}$.
2. 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 $x_1 = 1$.
3. 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?
4. 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?
5. 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?
6. 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?
7. 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.
8. Evaluate the following indefinite integrals.
   (a) $\int \left(x^{12} - 8x^{10} - \sin(x) + \cos(x) - e^x\right) dx.$
   (b) $\dfrac{x^2(x-1)}{\sqrt{x^3}} dx.$
9. Use the Fundamental Theorem of Calculus to evaluate the following definite integrals
   (a) $\displaystyle\int_0^2 (3x^2 + x + 2)\, dx$
   (b) $\displaystyle\int_1^e \left(\frac{1}{x^2} + \frac{1}{x}\right) dx$
10. The complete graph of a function is shown in figure 2; it consists of two line segments and a quarter circle. Evaluate
$$\int_{-2}^{4} f(x)dx.$$

11. Write down a right Riemann with $n = 4$ terms sum to estimate

$$\int_{-1}^{1} \cos(x)\, dx.$$

12. Use Σummation notation to write down a right Riemann sum with $n = 555$ terms to estimate

$$\int_{0}^{1} \sin(x)\, dx.$$

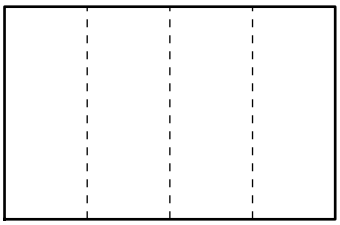

Figure 1: A partitioned corral

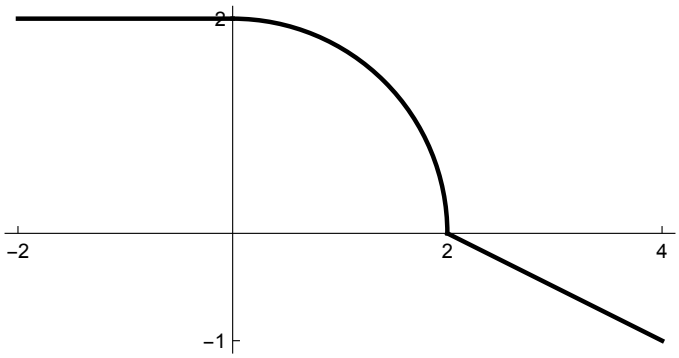

Figure 2: The complete graph of a function