Math 111, Introduction to the Calculus, Fall 2011
Midterm III Practice Exam 1

You will have 50 minutes for the exam and are not allowed to use books, notes or calculators.
Each question is worth 10 points.

1. Sketch a graph of the function
$$f(x) = \frac{x^2 - 1}{x^2 + 1}$$
   to show the horizontal asymptote, as well as the intervals on which f is increasing or decreasing. You should explain how you worked out each part of your answer.

2. Find the critical points of the function
$$f(x) = x^2 \sqrt{x + 1}$$
   and classify each critical point is a local maximum, local minimum, or neither.

3. Find the point on the curve $y = \sqrt{2x + 9}$ that is closest to the origin.

4. Calculate the integral
$$\int_{-1}^{2} (1 - x)\, dx$$
   in two ways:

   (a) by drawing a graph and finding the appropriate area or areas;

   (b) using the Fundamental Theorem of Calculus.

5. (a) Find the derivative of the function
$$f(t) = \int_{1}^{t^2} \frac{1}{x}\, dx.$$

   (b) Find an antiderivative $G(x)$ for the function
$$g(x) = 3\sin(x + \pi)$$
   that has the property that $G(0) = 5$.