Disclaimer: the questions below only represent my best guesses as to what *might* be on the exam. I don't have any inside information. The official practice exam – once it's posted – should give a better indication of what the real thing will look like.

I have *tried* to err on the side of making the practice exam too difficult, rather than too easy. Keep that in mind.

1. Find the equation of the tangent line to the curve $4x^2y + y^3 = 16$ at the point $(1, 2)$.

2. A baker wishes to make a square pizza. He begins by producing 450 cubic centimeters of dough for the crust, and rolling it flat. The baker rolls out the dough in such a way that the top of the dough remains perfectly square at all times, and the thickness decreases at a rate of 0.1 centimeters per second. When the dough is 2 centimeters thick, how quickly is its width growing?

3. Let $f(x) = 2x^3 + 5x^2 - 4x + 73$.
   (a) Where is $f(x)$ concave up? Where is it concave down?
   (b) Find the critical points of $f(x)$ and use the second derivative test to classify them as relative maxima or relative minima.

4. (a) Find all asymptotes of the curve $f(x) = \dfrac{2x^2 - 9x + 4}{x^2 - 3x - 4}$.
   (b) Sketch a graph of some function $g(t)$ for which:
   - $g'(t)$ is positive on $(-\infty, -4)$ and $(4, \infty)$, but negative on $(-4, 4)$;
   - $g''(t)$ is positive on $(-2, 0)$, but negative on $(-\infty, -2)$, $(0, 4)$, and $(4, \infty)$.

5. McGraw-Hill, a textbook publisher, wants to determine a price for the latest edition of their most popular calculus textbook. Their research indicates that a book priced at p dollars will sell $D(p) = 1500000p^{-1} - 1000$ copies. Naturally, McGraw-Hill intends to produce only as many textbooks as they can sell. Textbook production incurs a flat overhead cost of \$80,000, as well as a material cost of \$15 per book. At what price should McGraw-Hill sell their calculus book in order to maximize their profits?

6. Solve for x:
   (a) $2^{8-x} = 4^x$
   (b) $2^{3x} = 24 \cdot 3^{-x}$
   (c) $\ln x - \ln 4 = 2(\ln 3 - \ln 2)$