1. Sketch the graph by hand using asymptotes and intercepts, but not derivatives. Then use your sketch as a guide to producing graphs (with a graphing device) that display the major features of the curve. Use these graphs to estimate the maximum and minimum values.

$$f(x) = \frac{(2x+3)^2(x-2)^5}{x^3(x-5)^2}$$

2. If $f(x) = \dfrac{(2x+3)^2(x-2)^5}{x^3(x-5)^2}$, find f' and f'' and use their graphs to estimate the intervals of increase and decrease and concavity of f. Be sure to include graphs of f' and f'' to fully explain the behavior of f. Use technology to calculate these derivatives.

3. A rectangular storage container with an open top is to have a volume of 10 m^3. Then length of its base is twice the width. Material for the base costs \$10 per square meter. Material for the sides cost \$6 per square meter. Find the cost of materials for the cheapest such container.

4. A cylindrical can without a top is made to contain a volume of 2000 cubic centimeters of liquid. Find the dimensions that will minimize the cost of the metal to make the can.

5. A boat leaves a dock at 2:00 PM and travels due south at a speed of 20 km/h. Another boat has been heading due east at 15 km/h and reaches the same dock at 3:00 PM. At what time were the two boats closest together?

6. The manager of a 100-unit apartment complex knows from experience that all units will be occupied if the rent is \$800 per month. A market survey suggests that, on average, one additional unit will remain vacant for each \$10 increase in rent. What rent should the manager charge to maximize revenue?

7. Find the most general antiderivative of the function. (Check you answer by differentiation.)

$$f(x) = \frac{2+x^2}{1+x^2}$$

8. Two balls are thrown upward from the edge of the cliff 432 ft above the ground. The first is thrown at a speed of 48 ft/s and the other is thrown a second later with a speed of 24 ft/s. Do the balls ever pass each other?

9. (a) Batman was driving the Batmobile at 90 mph (=132 ft/sec), when he sees a brick wall directly ahead. When the Batmovile is 400 ft from the wall, he slams on the brakes, decelerating at a constant rate of 22 ft/s^2. Does he stop before he hits the brick wall? If so, how many feet to spare? If not, what is his impact speed?

   (b) Now the Joker had been driving next to Batman, also at 90 mph. But the Joker did not hit his brakes as soon as Batman, continuing for 1 second longer than Batman before hitting his brakes, decelerating at a constant rate of 22 ft/s^2. How fast is he going when he hits the wall? (Don't worry about Joker - he jettisoned at the last instant, to fight for another day!)