Exam 2 Practice Problems

1. Find $\dfrac{dy}{dx}$.
   (a) $y = 50\left(\dfrac{1}{2}\right)^{x/9}$
   (b) $y = \dfrac{e^{3x}}{(1+x^2)^2}$
   (c) $y = 2^{5x}\ln(1-x^2)$
   (d) $y = \ln\left(\sqrt[3]{\dfrac{e^2}{x(2x+7)^4}}\right)$
2. Suppose $C(q)$ is the cost that a company must pay to produce q units. If $C(1,250) = 3,600$ and $C'(1,250) = 2.4$, approximately how much would it cost the company to produce 1,300 units?
3. A company has the following cost and demand functions.
$$C(q) = 84 + 1.26q - .01q^2 + .00007q^3, \qquad p = 3.5 - .01q$$
   (a) If the price of each unit is \$1.20, how many units will be sold?
   (b) Determine the production level that will maximize profit for the company.
4. Evaluate $\log_4\left(\dfrac{1}{16}\right)$ and $\log_9(3)$.
5. Give an equation for the tangent line to the curve
$$2(x^2+y^2)^2 = 25(x^2-y^2)$$
   at the point $(3,1)$.
6. How much money would need to be deposited into an account that earns 6% annual interest compounded quarterly so that it is worth \$15,000 in 5 years?
7. How long will it take an investment to double if it earns 5% annual interest compounded continuously?
8. Suppose a radioactive material takes 3 years to decay to 99% of its original mass. Find the half-life of this material. Assume that the mass of the radioactive material obeys the law of natural growth.
9. A ladder 10 ft long rests against a vertical wall. If the bottom of the ladder slides away from the wall at a rate of 1 ft/s, how fast is the top of the ladder sliding down the wall when the bottom of the ladder is 6 ft from the wall?
10. Find the absolute maximum and absolute minimum values of $f(x) = \dfrac{x}{x^2+4}$ on the interval $[0,3]$.
11. Consider the function $f(x) = x^4 - 2x^2 + 2$.
    (a) Find the intervals on which f is increasing/decreasing.
    (b) Find the local maximum and minimum values of f.
    (c) Find the intervals of concavity and the inflection points.

adamski@fordham.edu