Read Section 3.3. Work the embedded problems.

1. Review (aka mini-quiz)

    (a) Fill in the following rules – from memory if possible!

    i. $\dfrac{d}{dx}[f(x)\,g(x)] =$ ii. $\dfrac{d}{dx}\left[\dfrac{f(x)}{g(x)}\right] =$

    (b) Find the derivative of each of the following. Use whatever rule you choose. Simplify if you have time.

    i. $H(x) = \frac{1}{3x}(8 + x^2)$

    ii. $G(x) = \frac{3x}{8+x^2}$

2. Determine the point (or points) where the graph $f(x) = x^3$ has a slope of 2. Write the equation of the tangent line at this point (or points). On the same axes, sketch $f(x)$ and the tangent line(s).

3. The concentration of an antibiotic in the bloodstream t hours after being injected is given by $C(t) = \dfrac{2t^2 + t}{t^3 + 50}$ where C is measured in milligrams per liter of blood.

   (a) Find $C(0)$ and $C(10)$ and explain (in complete sentences, including units) what these numbers mean in the context of the problem.

   (b) Find $C'(t)$. (Yes. This will be challenging/painful. I put the simplified answer at the bottom of this page so you can check your answer!)

   (c) It is the case that $C'(0) = 0.02$ and $C'(10) = -0.018$. Explain (in a complete sentence or sentences) what these numbers mean. **Include units.**

   (d) Briefly describe what seems to be occurring as the number of hours increases.

4. An ant walking along a sidewalk has traveled $s(t) = t^4 - 2t^2$ inches in t minutes. Find the acceleration of the ant (with units) when the velocity of the ant is 0.

5. Bonus Problem: Find the point on the graph of $f(x) = x^3$ such that the tangent line at that point has an y intercept of 6.

$$C'(t) = \frac{-2(t^4 + t^3 - 100t - 25)}{(t^3 + 50)^2}$$