Spring 2015 Math 151

Week in Review 4
courtesy: Amy Austin
(Covering sections (3.2-3.4)

Section 3.2

1. Find the derivative of the following functions:

   a.) $f(x) = 5x^5 - 7x^2 + x + 1$

   b.) $f(x) = (x^2 - x)(x - 2)$

   c.) $f(x) = x^5 + \sqrt{x} - \dfrac{3}{x^2}$

   d.) $f(t) = \dfrac{1 + t^2 - \sqrt[3]{t}}{t^2}$

   e.) $g(x) = \dfrac{x^2 + x - 4}{2x - x^3}$

   f.) $f(x) = |x^2 - 2x|$

2. Given $h = f(x)g(x)$, $g(3) = 6$, $g'(3) = 4$, $f'(3) = 2$, $f'(6) = 7$. Find $h'(3)$.

3. Given $h = \dfrac{f(x)}{g(x)}$, $g(3) = 6$, $g'(3) = 4$, $f'(3) = 2$, $f'(6) = 7$. Find $h'(3)$.

4. Find the points on the curve $y = x^3 - x^2 - x + 1$ where the tangent lines are horizontal, if any. If there are none, support your answer.

5. Find the points on the curve $y = 8x^3 + 5x + 1$ where the tangent line has slope, 1, if any. If there are none, support your answer.

6. Find the equation of the tangent line to the graph of $f(x) = \dfrac{x^2}{x - 4}$ at the point $\left(1, -\dfrac{1}{3}\right)$

7. Find the equation of both lines through the point $(2, -3)$ that are tangent to the parabola $y = x^2 + 2x$.

8. At what point on the curve $y = x\sqrt{x}$ is the tangent line parallel to the line $3x - y + 6 = 0$?

9. If $f(x) = \begin{cases} x^2 & \text{if } x \leq 2 \\ mx + b & \text{if } x > 2 \end{cases}$, find the value of m and b that make $f(x)$ differentiable everywhere.

Section 3.3

10. A particle moves according to the equation of motion

    $s(t) = 4t^3 - 9t^2 + 6t + 2$, where $s(t)$ is measured in meters and t in seconds.

    (a) Find the velocity at time t.

    (b) When is the particle at rest?

    (c) When is the particle moving in the positive direction?

    (d) Draw a diagram that represents the motion of the particle.

    (e) Find the distance traveled in the first 3 seconds.

11. A ball is thrown vertically upward with a velocity of 80 feet per second. The height after t seconds is given by $h(t) = 80t - 16t^2$. What is the maximum height of the ball?

Section 3.4

12. Compute the following limits:

    a.) $\lim\limits_{x \to 0} \dfrac{\sin 3x}{5x}$

    b.) $\lim\limits_{x \to 0} \dfrac{\sin(7x)}{\sin(5x)}$

    c.) $\lim\limits_{x \to 0} \dfrac{\sin^2 6x}{x^2}$

    d.) $\lim\limits_{x \to 0} \dfrac{\tan x}{4x}$

    e.) $\lim\limits_{x \to 0} \dfrac{\sin 8x}{\tan(5x)}$

    f.) $\lim\limits_{x \to 0} \dfrac{\cos x - 1}{\sin x}$

13. Find the derivative of the following functions:

    a.) $f(x) = \dfrac{\sin x}{1 + \cos x}$

    b.) $y = \sec x - 5 \tan x$

14. Find $f'(\dfrac{\pi}{6})$ for $f(x) = -2 \cot x$

15. Find the tangent line to the graph of

    $f(x) = \sec x - 2\cos x$ where $x = \dfrac{\pi}{3}$.