Math1210 Midterm 2 Extra Review

1. Let $y = 2x^3 - sec(\pi x) + \sqrt{x}$. If x changes from 1 to 1.035, approximately how much does y change?

2. Find the indicated derivative of the given functions.

(a) $D_x(\tan(4x^2 + 5x - 1)\cos^2(3x))$

(b) $\frac{d}{dx}\left(\frac{x^4 - 3x^2 + 1}{x^3 - \sqrt[4]{x}}\right)^5$

(c) $f'(1)$ if $f(x) = (2x - \frac{1}{x})^3 (4x^3 - 2)^4$

(d) $\frac{dy}{dx}$ given $2x^4 y + y^3 = 2x^2 - 6x$

(e) $f'''(x)$ for $f(x) = (3x - 4)^{\frac{2}{5}}$

3. A softball diamond has the shape of a square with sides 40 ft. long. If a player is running from second base to third base at a speed of 20 ft/sec, at what rate is her distance from home plate changing when she is 30 ft from third base?

4. For (i) $f(x) = \frac{x}{1 + x^2}$ and separately for (ii) $f(x) = (x^2 - 3)^2$, answer the following questions.

(a) Fill in the sign line for $f'(x)$.

(b) Find all local min and max **<u>point(s)</u>**.

(c) Fill in the sign line for $f''(x)$.

(d) Find all x-values of inflection point(s).

(e) Identify all critical **<u>points</u>** on the closed interval [-2, 2].

(f) Sketch the whole graph of the function using all this information.

5. Show that the tangent lines to the curves $y^2 = 4x^3$ and $2x^2 + 3y^2 = 14$ at (1, 2) are perpendicular to each other.

6. A 13 foot ladder is leaning against a vertical wall. If the bottom of the ladder is moving away from the wall at a constant rate of 0.5 ft/sec, how fast is the top of the ladder sliding down the wall when the top of the ladder is 5 feet above the ground?

7. Find $f^{(4)}(x)$ for $f(x) = (3x - 7)^{\frac{5}{3}}$

8. Let $y = \frac{2}{x}$. If x changes from 1 to 1.05, approximately how much does y change?

9. The area of an equilateral triangle is decreasing at a rate of 2 square centimeters per second. Find the rate at which the length of a side is changing when the area of the triangle is $100\sqrt{3}$ square centimeters. (Note: Area of equilateral triangle with side length x is $A = \frac{\sqrt{3}}{4}x^2$.)