MATH 1571 | Calculus I: Exam 1 | Spring 2009

Name : _____ Score : ____/____

1. Calculate the derivative of each of the following functions:

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

   (b) $y = \frac{3x - 2}{2x^2 + x + 1}$

   (c) $y = 4x - 3x^2$

   (d) $y = 3x^4 + \sin(x)$

   (e) $y = (9x^3) * (4 - x^2)$

   (f) $y = (x) * \cos(x)$

2. Find the following limits if they exist, **showing all work. If the limit does not exist, explain why.**

   (a) $\lim_{x \to 0} \frac{\cos x - 1}{x}$

   (b) $\lim_{x \to 0} \frac{\sin^2(x)}{x}$

   (c) $\lim_{x \to 3} \frac{x^2 - 9}{x - 3}$

   (d) $\lim_{h \to 0} \frac{\sqrt[2]{4 + h} - 2}{h}$

3. Find the equation of the tangent line at $x = 1$ to the curve

   $$y = 4 * x^2 + x$$

   at

4. At what points (x, y) on the curve

   $$y = x^3 - x,$$

   is the tangent line horizontal?

5. An object moves along a horizontal coordinate line. Its distance s from the origin at the end of t seconds is

$$s = t^3 - 6t^2 + 9t$$

feet.

(a) When is the velocity positive?

(b) When is its acceleration positive?

6. Find the derivative, using the definition of the derivative.

$$\frac{d}{dx}(\sqrt{(}x)$$

Verify your answer.

7. Sketch each of the following and find the indicated limits.

(a) $\lim_{x\to 0^+} f(x)$ and $\lim_{x\to 0^-} f(x)$ of the following:

$f(x) = +1;\ x > 0$

$f(x) = 0;\ x = 0$

$f(x) = -1;\ x < 0$

(b) Find $\lim_{x\to 1^+} f(x)$ and $\lim_{x\to 1^-} f(x)$ of the following:

$f(x) = -5x + 12;\ x > 1$

$f(x) = -7;\ x = 1$

$f(x) = 5x;\ x < 1$

8. Sketch the graph and then use the definition of continuity to discuss the continuity at the indicated point.

(a) $f(x) = \dfrac{x^2}{|x|}\ x \neq 0$

Define P such that $f(x)$ is continuous at $x = 0$?

(b) Define $f(x)$ as follows: $f(x) = x - 3\ , x \geq 1$

$f(x) = x^2 - 2x - 1\ , x < 1$

Prove it is continuous continuous at $x = 1$?