

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) $y = (9x^3) * \sec(x)$

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

(g) Find $f'(\pi/4)$ if $f(x) = \frac{\tan x}{1 + \cos x}$.

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

(a) $\lim_{x \rightarrow 0} \frac{2}{x^2}$

(b) $\lim_{x \rightarrow 3} \frac{x^2 - 9}{x - 3}$

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

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

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

Verify your answer.

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

(a) $\lim_{x \rightarrow 0^+} f(x)$ and $\lim_{x \rightarrow 0^-} f(x)$ of the following:
 $+1; x > 0$

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

$$-1; x < 0$$

(b) Find $\lim_{x \rightarrow 1^+} f(x)$ and $\lim_{x \rightarrow 1^-} f(x)$ of the following:
 $-5x + 12; x > 1$

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

$$5x; x < 1$$

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

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

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 $x = 1$?