

Mathematics 141 Test #1

Name: _____

Show your work to get credit. An answer with no work will not get credit.

(1) (45 points) Compute the following derivatives. You do not have to simplify your answers.

(a) $y = 4x^5 - 9x^3 + 7x^2 - 4x + 3$

$$y' =$$

(b) $y = 2x^{-5} + 3\pi^{-4}$

$$y' =$$

(c) $A(t) = \frac{4}{t^3} - \frac{7}{t^6}$

$$A'(t) =$$

(d) $y = \cos(x)$

$$y' =$$

(e) $y = \sin(x)$

$$y' =$$

(f) $y = \tan(x)$

$$y' =$$

(g) $y = \sec(x)$

$$y' =$$

(h) $P(t) = 3(t^2 + t + 1)(t^4 + t^2 + 3)$

$$P'(t) =$$

(i) $R(t) = \frac{5t^3 + t}{4t^2 + 6}$

$$R'(t) =$$

(j) $y = \cos(x^2)$

$$y' =$$

(k) $y = \sin^2(2x)$

$$y' =$$

$$(l) \ y = \frac{x^2 + \tan(x)}{4 + \cos(x)}$$
$$y' =$$

$$(m) \ M(t) = 7(x^4 - 3x^2 + 6)^{11}$$
$$M'(t) =$$

$$(n) \ y = \left(\frac{x}{x+1} \right)^3$$
$$y' =$$

$$(o) \ D_t \left(\frac{\sin t}{\cos 2t} \right)^3 =$$

(2) (10 points) Compute the following limits.

$$(a) \ \lim_{x \rightarrow 3} \frac{x^2 + 4}{x + 5} =$$

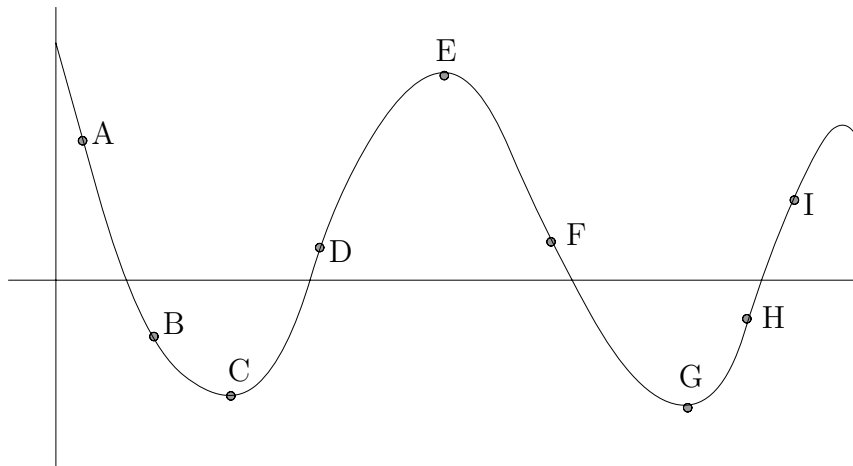
$$(b) \ \lim_{t \rightarrow 2} \frac{t^2 - t - 2}{t - 2} =$$

(c) $\lim_{\theta \rightarrow 0} \frac{1 - \cos \theta}{\theta} =$

(d) $\lim_{x \rightarrow 0} \frac{\sin(3x)}{2x} =$

- (3) (5 points) What is the equation of the tangent line to $y = 3x^2 - 4x + 1$ at the point where $x = -2$?

- (4) (10 points) Let $y = f(x)$ have the following graph.



- (a) At which of the labeled points is $f'(x) > 0$?

- (b) At which of the labeled points is $f'(x) < 0$?

- (c) At which of the labeled points is $f'(x) = 0$?

(5) (10 points)

(a) State what it means for a function to be continuous.

(b) State the Intermediate Value Theorem.

(c) Show that the equation $\cos(2x) - x^2 = 0$ has at least one solution between $x = 0$ and $x = 2$.

(6) (10 points)

(a) State the definition of derivative in terms of a limit.

(b) Use the definition of the derivative to compute $f'(8)$ where $f(x) = \sqrt{2x}$.

- (7) (5 points) A ball rolls down a long plane so that its distance s from its starting point after t seconds is $s = 3t^2 + 2t$ feet. When is its instantaneous velocity 14 feet per second.

- (8) (5 points) What is the period and amplitude of the function $f(t) = 2 - 3 \cos(4t)$?

Period= _____

Amplitude = _____