

## 2.1 Derivative Basics: Quiz E

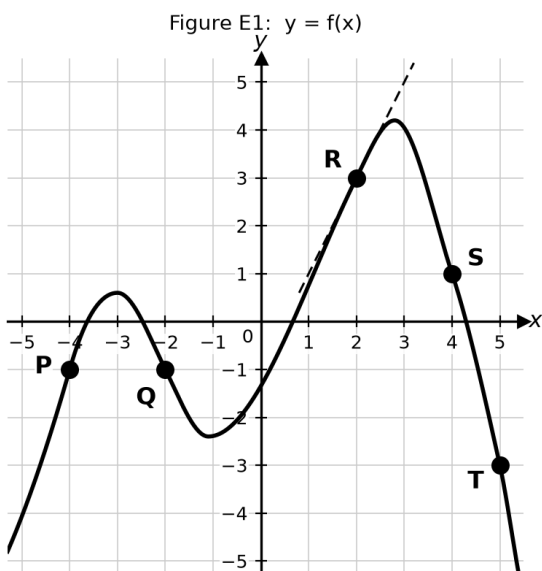
Name: \_\_\_\_\_

Time: 25 minutes No calculator 40 points

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Answer exactly the question asked. Show work on Questions 2, 4, and 5.  
If a derivative does not exist, write DNE. If a function value does not exist, write *undefined*.

1. Questions 1(a)–1(e) refer to Figure E1, the graph of  $f$ . (2 each, 10 pts)  
The labeled points are on the graph; the dashed line is tangent to the graph at  $R$ .



- (a)  $\lim_{x \rightarrow 2} \frac{f(2) - f(x)}{x - 2}$  \_\_\_\_\_
- (b)  $\lim_{x \rightarrow 2} f(x)$  \_\_\_\_\_
- (c) An equation of the tangent line at  $R$  \_\_\_\_\_
- (d) The labeled point at which  $f'(x)$  is greatest \_\_\_\_\_
- (e) Every labeled point at which  $f'(x) < 0$  \_\_\_\_\_

2. Let  $f(x) = \sqrt{x}$ . Evaluate  $\frac{f(4+h) - f(4)}{h}$  for  $h = 5$ . (4 pts)

3. Answer only. (3 each, 6 pts)

- (a) The limit  $\lim_{x \rightarrow -3} \frac{x^2 - 9}{x + 3}$  equals  $f'(c)$  for the function  $f(x) = x^2$ .  
Find  $c$ . \_\_\_\_\_

- (b) Evaluate  $\lim_{x \rightarrow 1} \frac{x^4 - 1}{1 - x}$ . \_\_\_\_\_

4. Let  $f(x) = \sqrt{2x - 1}$ .

(a) Use the definition below to find  $f'(x)$ .

**(8 pts)**

An answer found without the definition earns at most 2 points.

$$f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$$

(b) Find every point  $(x, y)$  on the graph of  $f$  at which the tangent line has slope  $\frac{1}{3}$ .

**(4 pts)**

5. Let  $g(x) = \frac{x}{x+3}$ . Use the definition below with  $c = -1$  to find  $g'(-1)$ .

**(8 pts)**

An answer found without the definition earns at most 2 points.

$$g'(c) = \lim_{x \rightarrow c} \frac{g(x) - g(c)}{x - c}$$