# Math 131 - Quiz 5

October 7, 2020

Name key

Score

The following problems are from the suggested homework. Show all work to receive full credit. Supply explanations when necessary. You must work individually on this quiz. This quiz is due October 12.

1. (2 points) Use the graph below to determine each of the following, or explain why it does not exist.

$$f'(0.5), \quad f'(0), \quad f'(1), \quad f'(2), \quad f'(3)$$

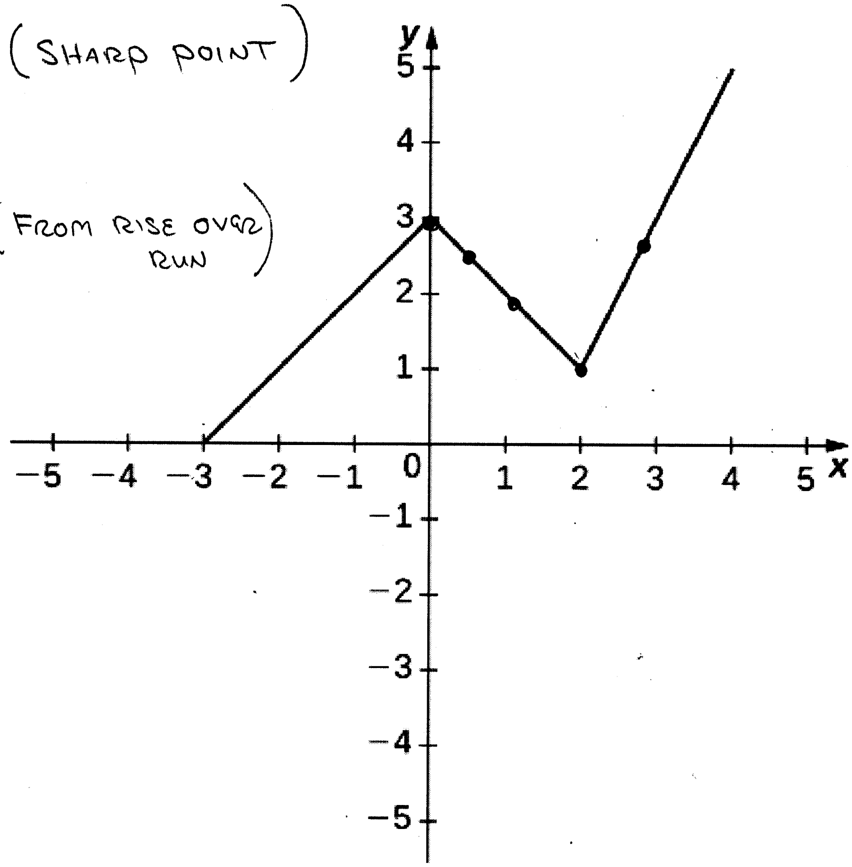
$f'(0.5) = -1$ (FROM RISE OVER RUN)

$f'(0)$ DNE (SHARP POINT ON GRAPH)

$f'(1) = -1$ (FROM RISE OVER RUN)

$f'(2)$ DNE (SHARP POINT)

$f'(3) = 2$ (FROM RISE OVER RUN)



2. (2 points) Use the limit definition of derivative to determine $f'(x)$ if $f(x) = 9/x$.

$$f'(x) = \lim_{h\to 0} \frac{\frac{9}{x+h} - \frac{9}{x}}{h} = \lim_{h\to 0} \frac{\frac{9x - 9(x+h)}{(x+h)x}}{h}$$

$$= \lim_{h\to 0} \frac{-9\cancel{h}}{(x+h)x\cancel{h}} = \frac{-9}{x^2}$$

$$f'(x) = -\frac{9}{x^2}$$

3. (2 points) Use the limit definition of derivative to determine $f'(x)$ if $f(x) = x^2 + x$. Then use your result to find an equation of the line tangent to the graph of $f$ at $x = 1$.

$$f'(x) = \lim_{h\to 0} \frac{[(x+h)^2 + (x+h)] - [x^2+x]}{h} = \lim_{h\to 0} \frac{x^2 + 2xh + h^2 + x + h - x^2 - x}{h}$$

$$= \lim_{h\to 0} \frac{2xh + h^2 + h}{h} = \lim_{h\to 0} (2x + h + 1) = 2x+1$$

$f'(x) = 2x+1$

$m = f'(1) = 3$

POINT: $x = 1$, $y = f(1) = 2$

TAN. LINE..

$y - 2 = 3(x-1)$

OR

$y = 3x - 1$

4. (2 points) Let $h(x) = \dfrac{f(x)}{g(x)}$. Determine $h'(2)$. Use the appropriate information below when necessary.

| $x$ | $f(x)$ | $f'(x)$ | $g(x)$ | $g'(x)$ |
|---|---|---|---|---|
| 1 | 3 | 2 | $-1$ | 4 |
| 2 | 5 | 3 | 7 | 1 |
| 3 | $-2$ | $-4$ | 8 | 2 |
| 4 | 0 | 6 | $-3$ | 9 |

$$h'(x) = \frac{f'(x)g(x) - f(x)g'(x)}{(g(x))^2} \Rightarrow h'(2) = \frac{f'(2)g(2) - f(2)g'(2)}{(g(2))^2}$$

$$= \frac{3(7) - 5(1)}{7^2} = \frac{16}{49}$$

5. (2 points) Let $h(x) = f(x)/g(x)$. Use the graph below to determine each of the following, or explain why it does not exist.

$h'(1)$, $h'(3)$, $h'(4)$

$$h'(x) = \frac{f'(x)g(x) - f(x)g'(x)}{(g(x))^2}$$

$$h'(4) = \frac{(1)(2.5) - 2(0)}{(2.5)^2} = \frac{1}{2.5} = \frac{2}{5}$$

$$h'(1) = \frac{(-1)(1) - (3)(1)}{(1)^2} = -4$$

$h'(3)$ DNE

BECAUSE

$f'(3)$ DNE