

Name _____

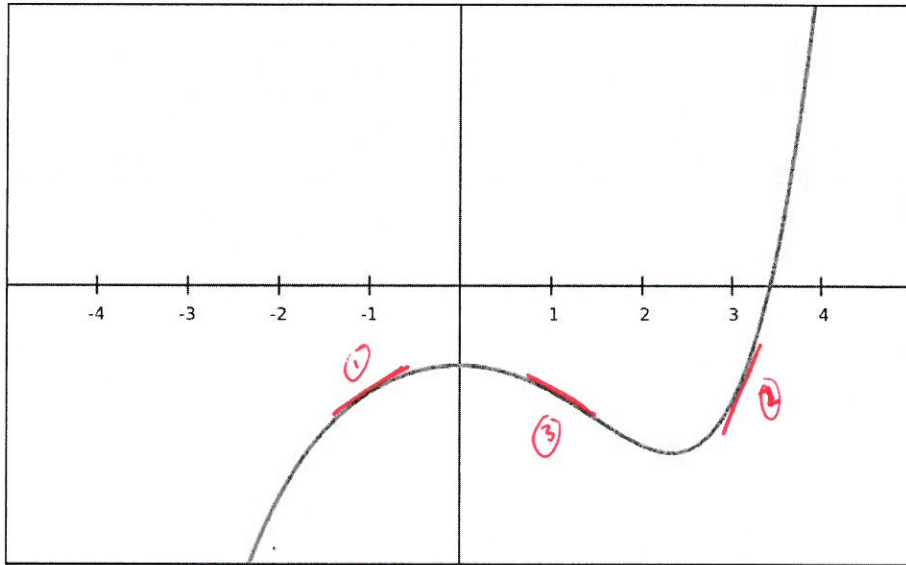
MATH-1951

Quiz 3 - (2.7, 2.8, 3.1)

Answer the following questions, and show your work. Scientific calculator only.

[1] (3 points total) For the function f whose graph is given, arrange the following numbers from smallest to largest. No work required.

$$0 \quad f'(-1) \quad f'(3) \quad f'(1)$$



$$\textcircled{3} < 0 < \textcircled{1} < \textcircled{2}$$
$$f'(1) < 0 < f'(-1) < f'(3)$$

2

[2] (4 points total) Given the function $f(x) = -3x^2 + 1$.

a) (2.5 points) Find the derivative to the function using the limit definition of the derivative.

$$\begin{aligned}
 f'(x) &= \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h} = \lim_{h \rightarrow 0} \frac{(-3(x+h)^2 + 1) - (-3x^2 + 1)}{h} \\
 &= \lim_{h \rightarrow 0} \frac{-3(x+h)(x+h) + 1 + 3x^2 - 1}{h} \\
 &= \lim_{h \rightarrow 0} \frac{-3(x^2 + 2xh + h^2) + 3x^2}{h} \\
 &= \lim_{h \rightarrow 0} \frac{-3x^2 - 6xh - 3h^2 + 3x^2}{h} \\
 &= \lim_{h \rightarrow 0} \frac{h(-6x - 3h)}{h} = \lim_{h \rightarrow 0} -6x - 3h = -6x
 \end{aligned}$$

$f'(x) = -6x$

b) (1.5 points) Use your answer to part a) to find the equation of the tangent line to f at $x=1$.

$$m = f'(1) = -6 \cdot 1 = -6$$

$$x=1, f(1) = -3 \cdot 1^2 + 1 = -2$$

$(1, -2)$

$$y - (-2) = -6(x - 1)$$

$$y + 2 = -6x + 6$$

$$y = -6x + 4$$

[3] (3 points total) Find the derivative of the function $f(x) = e^x + x^e + e^e$.

$$f'(x) = e^x + ex^{e-1} + 0$$

$$f'(x) = e^x + ex^{e-1}$$