Name: Key Date: 28 March 2020

Quiz 3: You must show all work to receive credit. Calculators are prohibited.

(1) (§3.1, #23, 10 points) Using the definition of the derivative, the slope of the tangent line to the curve defined by $f(x) = 3x^2 - 4x$ at the point $P(1, -1)$.

$$f'(x) = \lim_{h\to 0} \frac{f(x+h)-f(x)}{h} = \lim_{h\to 0} \frac{3x^2 - 6xh + 3h^2 - 4x - 4h - 3x^2 + 4x}{h}$$

$$= \lim_{h\to 0} \frac{h(-6x + 3h - 4)}{h}$$

$$= \lim_{h\to 0} -6x + 3h - 4$$

$$f'(1) = -6 - 4 = -10$$

(2) (§3.4, #37, 10 points) Using the rules of differentiation, determine $g'(x)$ if:

$$g(x) = \frac{e^x}{x^2 - 1}.$$

$$g'(x) = \frac{(e^x)'(x^2-1) - (e^x)(x^2-1)'}{(x^2-1)^2}$$

$$= \frac{e^x(x^2-1) - e^x(2x)}{x^4 - 2x^2 + 1}$$

$$= e^x\left(\frac{x^2 - 2x - 1}{x^4 - 2x^2 + 1}\right)$$