

1. Compute the following derivatives, using the standard differentiation rules and the chain rule.

a. (3 pts)

$$a(x) = \sin(\cos(x))$$

$$a'(x) = \lim_{\Delta x} \frac{d}{dx} (\sin(g)) \cdot \frac{d}{dx} (\cos(x))$$

$$a'(x) = \cos(g) (-\sin(x))$$

$$a'(x) = \cos(\cos(x)) (-\sin(x))$$

$$a'(x) = -\cos(\cos(x)) \sin(x)$$



b. (3 pts)

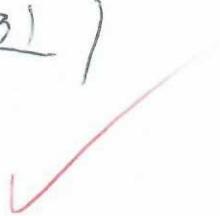
$$b(x) = \left( \frac{2x-3}{x} \right)^2$$

$$b'(x) = \frac{d}{dx}(g^2) \cdot \frac{d}{dx} \left( \frac{2x-3}{x} \right)$$

$$b'(x) = 2g \cdot \frac{2x-(2x-3)}{x^2}$$

$$b'(x) = 2\left(\frac{2x-3}{x}\right) \left( \frac{2x-(2x-3)}{x^2} \right)$$

$$b'(x) = \frac{12x-18}{x^3}$$



$$b(x) = (\text{stuff})^2$$

$$\text{stuff}' = \left( \frac{2x-3}{x} \right)'$$

$$b'(x) = 2(\text{stuff}) \cdot \text{stuff}'$$

$$= \left( \frac{2x-3}{x} \right)'$$

$$= 2\left(\frac{2x-3}{x}\right) \cdot \frac{3}{x^2}$$

$$= \left( 2 - \frac{3}{x} \right)'$$

$$= \frac{6(2x-3)}{x^3}$$

$$= (-3x^{-1})'$$

$$= 3x^{-2} = \frac{3}{x^2}$$

c. (2 pts)

$$c(x) = e^{(x^3)}$$

$$e^{(x^3)} \cdot (3x^2)$$

$f(g(x))$

stuff ✓

$$= e$$

$$f(x) = e^x$$

$$f'(x) = e^x$$

$$g(x) = x^3$$

$$g'(x) = 3x^2$$

2. (2 pts) Write the local linearization of  $c(x) = e^{(x^3)}$  at  $x = 0$ , and use it to estimate  $c(0.1)$ .

$$f(0) = e^{(0^3)} = e^0 = 1 \quad \checkmark$$

$$f'(0) = e^{(0^3)} \cdot (3(0)^2) = 0 \quad \checkmark$$

$$\begin{aligned} L(x) &= f(x) = f(0) + f'(0)(x - 0) \\ &= 1 + 0(x - 0) \quad \checkmark \end{aligned}$$

$$c(0.1) \approx L(0.1) = 1 + 0(0.1 - 0)$$

$$= 1$$

Good!