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

a. (3 pts) $a(x) = \sin(\cos(x))$

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

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

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

$a'(x) = -\cos(\cos x)\sin(x)$ ✓

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

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

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

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

$b'(x) = \frac{12x-18}{x^3}$ ✓

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

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

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

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

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

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

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

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

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

c. (2 pts) $c(x) = e^{(x^3)}$

$$\underbrace{e^{(x^3)}}_{f'(g(x))} \cdot \underbrace{(3x^2)}_{g'(x)}$$

$= e^{\text{stuff}}$

$f(x) = e^x$

$f'(x)\ e^x$

$g(x) = x^3$

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

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

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

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

$L(x) = f(x) = f(0) + f'(0)(x - 0)$

$= 1 + 0(x - 0)$

$c(0.1) \simeq L\ \cancel{f}(0.1) = 1 + 0(0.1 - 0)$

$= 1$

Good!