# Quiz 4 — Monday, July 19

Name: Solution Key

**1.** (*4 points*) Compute the following. You do not need to justify your answers.

(a) $\dfrac{d}{dx}(5) =$ $0$

(b) $\dfrac{d}{dz}(\cos z) =$ $-\sin z$

(c) $\lim\limits_{\theta \to 0} \dfrac{\sin\theta}{\theta} =$ $1$

(d) $\dfrac{d}{dx}(2x^4 - 3x^{-3}) =$ $8x^3 + 9x^{-4}$

**2.** (*3 points*) Let $f(x) = \dfrac{e^x}{x^2}$. Compute $f'(x)$.

*Solution*: We write $f(x) = e^x x^{-2}$ and use the product rule:

$$f'(x) = (e^x)'(x^{-2}) + (e^x)(x^{-2})' = e^x x^{-2} + e^x(-2x^{-3}) = \frac{e^x(x-2)}{x^3}.$$

*Solution*: We use the quotient rule:

$$f'(x) = \frac{(e^x)'(x^2) - (e^x)(x^2)'}{(x^2)^2} = \frac{e^x x^2 - 2e^x x}{x^4} = \frac{e^x(x-2)}{x^3}.$$

**3.** (*3 points*) Let $w = \sin(z^2)$. Compute $\dfrac{dw}{dz}$.

*Solution*: We use the chain rule, with $w = \sin u$ and $u = z^2$:

$$\frac{dw}{dz} = \frac{dw}{du} \cdot \frac{du}{dz} = (\cos u)(2z) = (\cos(z^2))(2z) = 2z\cos(z^2).$$