

MATH 161: Quiz 6

Name: key

Directions:

- * Show your thought process (commonly said as "show your work") when solving each problem for full credit.
- * If you do not know how to solve a problem, try your best and/or explain in English what you would do.
- * Good luck!

1. Differentiate the following. You are allowed to use shortcuts.

(a) $f(x) = -2(x^2 - 1) \sin(x)$ *left right product rule.*

$$f'(x) = -2 \frac{d}{dx} \left[(x^2 - 1) \cdot \sin(x) \right]$$

$$= -2 \left((x^2 - 1) \cdot \frac{d}{dx} [\sin(x)] + \sin(x) \cdot \frac{d}{dx} (x^2 - 1) \right)$$

$$= -2 \left((x^2 - 1) \cdot \cos(x) + \sin(x) \cdot 2x \right)$$

$$= \boxed{-2x^2 \cos(x) + 2\cos(x) - 4x \sin(x)}$$

(b) $g(x) = \frac{1}{x} = x^{-1}$

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

$$= \boxed{-\frac{1}{x^2}}$$

$$(c) f(x) = (x^2 - 1)(x^2 + 1)$$

$$= x^4 - 1$$

$$f'(x) = \frac{d}{dx} [x^4] - \frac{d}{dx} [1]$$

$$= \boxed{4x^3}$$

$$(d) g(x) = \frac{e^{2x}}{x^2} \quad \text{quotient} \quad \text{chain.}$$

$$g'(x) = \frac{x^2 \frac{d}{dx} [e^{2x}] - e^{2x} \frac{d}{dx} [x^2]}{(x^2)^2}$$

$$= \frac{x^2 \cdot e^{2x} \cdot \frac{d}{dx} [2x] - e^{2x} \cdot 2x}{x^4}$$

$$= \frac{2x^2 e^{2x} - 2x e^{2x}}{x^4}$$

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

$$= \boxed{\frac{2e^{2x} (x - 1)}{x^3}}$$

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$$\frac{d}{dx} [e^{e^x}] = e^{e^x} \cdot \frac{d}{dx} [e^x]$$

$$= \boxed{e^{e^x} \cdot e^x} \leftarrow 2 \text{ pt}$$