

Name: _____

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There are 25 points possible on this quiz. No aids (book, calculator, etc.) are permitted. **Show all work for full credit.**

1. [15 points] Find the derivative for each function below. You do not need to simplify. You do need to use parentheses correctly.

a. $y = \csc(x) + \sin(\pi/4)$

$$y' = -\csc(x)\cot(x) + 0 = -\csc(x)\cot(x)$$

b. $f(x) = \sec(2x)$

$$f'(x) = \sec(2x) \cdot \tan(2x) \cdot 2 = 2 \sec(x) \tan(x)$$

c. $g(x) = x^2 \cos^{-5}(x) = x^2 (\cos(x))^{-5}$

$$\begin{aligned} g'(x) &= 2x (\cos(x))^{-5} + x^2 \cdot (-5) (\cos(x))^{-6} (-\sin(x)) \\ &= 2x (\cos(x))^{-5} + 5x^2 \sin(x) (\cos(x))^{-6} \end{aligned}$$

d. $h(\theta) = \sin^4(\pi\theta) = (\sin(\pi\theta))^4$

$$h'(\theta) = 4 (\sin(\pi\theta))^3 (\cos(\pi\theta)) (\pi) = 4\pi \cos(\pi\theta) (\sin(\pi\theta))^3$$

e. $y = \sqrt{6x + \tan(x/2)} = [6x + \tan(\frac{1}{2}x)]^{\frac{1}{2}}$

$$y' = \frac{1}{2} [6x + \tan(\frac{1}{2}x)]^{-\frac{1}{2}} (6 + \sec^2(\frac{1}{2}x) \cdot \frac{1}{2}) = \frac{6 + \frac{1}{2} \sec^2(\frac{x}{2})}{2\sqrt{6x + \tan(\frac{1}{2}x)}}$$

2. [5 points] Find $f''(x)$ for the function $f(x) = \sin(2x^2)$.

$$f'(x) = \cos(2x^2) (4x) = 4x \cos(2x^2)$$

$$\begin{aligned} f''(x) &= 4 \cos(2x^2) + 4x (-\sin(2x^2)(4x)) \\ &= 4 \cos(2x^2) - 16x^2 \sin(2x^2) \end{aligned}$$

3. [5 points] Let $g(x) = (x^2 - 6x)^5$.

- a. Find $g'(x)$.

$$g'(x) = 5(x^2 - 6x)^4 (2x - 6) = 10(x - 3)(x^2 - 6x)^4$$

- b. Find all x -values where the graph of $g(x)$ has a horizontal tangent.

horizontal tangent means $g'(x) = 0$.

$$\text{Let } 0 = 10(x - 3)(x^2 - 6x)^4$$

$$\text{So } x - 3 = 0 \quad \text{or} \quad x^2 - 6x = 0$$

$$\text{So } x = 3 \quad \text{or} \quad x(x - 6) = 0$$

$$x = 0 \quad \text{or} \quad x - 6 = 0$$

$$x = 6$$

ANSWER :

$x = 0, 3, 6$