

Name SOLUTIONS

- No calculators allowed.
- Show sufficient work to justify each answer.
- You have 15 minutes for this quiz.

1. (2 points each) Differentiate the following functions.

(a) $g(t) = \frac{t^3}{\sec t}$

$$g'(t) = \frac{(t^3)'(\sec t) - (t^3)(\sec t)'}{(\sec t)^2}$$

$$g'(t) = \frac{3t^2 \sec t - t^3 \sec t \tan t}{\sec^2 t}$$

(b) $y = \sec x \cot x \sin x \cos x \csc x$

$$y = \sec x \cos x \csc x \sin x \cot x$$

$$y = \frac{1}{\cos x} \cdot \cos x \cdot \frac{1}{\sin x} \cdot \sin x \cdot \cot x$$

$$y = \cot x$$

$$\frac{dy}{dx} = -\csc^2 x$$

2. (3 points) Given $h(t) = \tan(5t)$, find its second derivative $h''(t)$.

$$h'(t) = \sec^2(5t) \cdot (5t)'$$

$$h'(t) = \sec^2(5t) \cdot 5$$

$$h'(t) = 5(\sec(5t))^2$$

$$h''(t) = 5 \cdot 2 \sec(5t) \cdot (\sec(5t))'$$

$$h''(t) = 10 \sec(5t) \cdot \sec(5t) \tan(5t) \cdot (5t)'$$

$$h''(t) = 10 \sec^2(5t) \tan(5t) \cdot 5$$

$$h''(t) = 50 \sec^2(5t) \tan(5t)$$

3. (3 points) Differentiate the following function.

$$g(x) = \sqrt[3]{\sin(x^5 + 4x)}$$

$$g(x) = (\sin(x^5 + 4x))^{1/3}$$

$$g'(x) = \frac{1}{3} (\sin(x^5 + 4x))^{-2/3} \cdot (\sin(x^5 + 4x))'$$

$$g'(x) = \frac{1}{3} (\sin(x^5 + 4x))^{-2/3} \cdot \cos(x^5 + 4x) \cdot (x^5 + 4x)'$$

$$g'(x) = \frac{1}{3} (\sin(x^5 + 4x))^{-2/3} \cdot \cos(x^5 + 4x) \cdot (5x^4 + 4)$$