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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 of each function. You do not need to simplify your answer.

(a) $f(x) = \sqrt{1+\cos(x)}$ $= (1+\cos(x))^{1/2}$

$$f'(x) = \frac{1}{2}(1+\cos(x))^{-1/2}(-\sin(x)) = \frac{-\sin(x)}{2\sqrt{1+\cos(x)}}$$

(b) $g(\theta) = 5\cot(\theta)$

$$g'(\theta) = -5\csc^2\theta$$

(c) $x(t) = \frac{6}{t^2} + \frac{\csc(t)}{6}$ $= 6t^{-2} + \frac{1}{6}\csc(t)$

$$x'(t) = -12t^{-3} - \frac{1}{6}\cot(t)\csc(t)$$

(d) $f(x) = x^3\sec(x)$

$$f'(x) = 3x^2 \cdot \sec(x) + x^3\sec(x)\tan(x)$$

(e) $h(x) = \frac{\tan(2x)}{x^2+1}$

$$h'(x) = \frac{(x^2+1)(\sec^2(2x))(2) - (\tan(2x))(2x)}{(x^2+1)^2}$$

2. (6 points) Find $\frac{d^3y}{dx^3}$ for $y = x^{-1} + \sin(5x)$.

$$\frac{dy}{dx} = -x^{-2} + 5\cos(5x)$$

$$\frac{d^2y}{dx^2} = 2x^{-3} - 25\sin(5x)$$

$$\frac{d^3y}{dx^3} = -6x^{-4} - 125\cos(5x)$$

3. (4 points) Determine all x-values where the graph of $H(x) = (3x^2 + x)^{-1}$ has a horizontal tangent.

$$H'(x) = -(3x^2+x)^{-2}(6x+1) = \frac{-(6x+1)}{3x^2+x}$$

$H'(x) = 0$ when $6x+1=0$ or $x = -1/6$.

(A quick check ensures $x=-1/6$ is in the domain of $H(x)$ b/c $3(-\frac{1}{6})^2 - \frac{1}{6} = \frac{3}{36} - \frac{1}{6} = \frac{1}{12} - \frac{1}{6} \neq 0$)