Name: Solutions _____ / 25

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 below. You do not need to simplify your answer.

a. $F(x) = \sqrt{1+x^4}$ $= (1+x^4)^{1/2}$

$$F'(x) = \frac{1}{2}(1+x^4)^{-1/2}(4x^3) = \frac{2x^3}{\sqrt{1+x^4}}$$

b. $f(x) = 3\csc(x)$

$$f'(x) = -3\csc(x)\cot(x)$$

c. $G(x) = \dfrac{1}{\sin^2(x)+\cos^2(x)}$ $= \frac{1}{1} = 1$

$$G'(x) = 0$$

d. $g(\theta) = \tan(\theta^2+1)$

$$g'(\theta) = \sec^2(\theta^2+1)(2\theta) = 2\theta\sec^2(\theta^2+1)$$

e. $h(x) = \sec(x) + (\cot(x))^2$

$$h'(x) = \sec(x)\tan(x) + 2(\cot(x))^1(-\csc^2(x))$$

$$= \sec(x)\tan(x) - 2\cot(x)\csc^2(x)$$

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

$y = x^2 + 5\sin(x)$

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

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

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

3. [4 points] Determine where the graph of $f(x) = \frac{4}{x^2+2x}$ has a horizontal tangent.

$f(x) = 4(x^2+2x)^{-1}$; horizontal tangent means $f' = 0$.

$f'(x) = 4(-1)(x^2+2x)^{-2}(2x+2)$

$= \frac{-4(2x+2)}{(x^2+2x)^2} = \frac{-8(x+1)}{(x^2+2x)^2} = 0$

So $-8(x+1) = 0$.

So $\boxed{x = -1}$.