Math 201 - Quiz #4   Name: _____

1. **Solve two of the following parts. Please put an X through the parts you do not want graded.** Compute the derivative for each of the following. Full simplification is not necessary, but your final answer should not have any derivatives.

(a) $f(x) = 5\tan(x) + \cos(2x^{10} + 1)$

$$f'(x) = 5\sec^2(x) + \left(-\sin(2x^{10}+1)\right)\frac{d}{dx}\left(2x^{10}+1\right)$$

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answer: $\boxed{f'(x) = 5\sec^2(x) - \sin(2x^{10}+1)(20x^9)}$

(b) $y = \dfrac{\sin(5x)}{x^2+1}$

$$y' = \frac{(x^2+1)\frac{d}{dx}\sin(5x) - \sin(5x)\frac{d}{dx}(x^2+1)}{(x^2+1)^2}$$

answer: $\boxed{y' = \dfrac{(x^2+1)\cos(5x)5 - \sin(5x)(2x)}{(x^2+1)^2}}$

(c) $y = \sqrt{\sec(5x-1)} = \left(\sec(5x-1)\right)^{1/2}$

$$y' = \frac{1}{2}\left(\sec(5x-1)\right)^{-1/2}\frac{d}{dx}\sec(5x-1)$$
$$= \frac{1}{2}\left(\sec(5x-1)\right)^{-1/2}\sec(5x-1)\tan(5x-1)\frac{d}{dx}(5x-1)$$

answer: $\boxed{y' = \frac{1}{2}\left(\sec(5x-1)\right)^{-1/2}\sec(5x-1)\tan(5x-1)(5)}$

(d) $y = e^{x\cot(x)}$

$$y' = e^{x\cot(x)}\frac{d}{dx}(x\cot(x))$$
$$y' = \boxed{e^{x\cot(x)}\left(x\left(-\csc^2(x)\right) + \cot(x)\right)}$$

answer:

2. Find $\frac{dy}{dx}$ of the eqation $x^2 + 3xy + y^2 = \tan^2(x)$ using implicit differentiation.

$$\frac{d}{dx}\left(x^2 + 3xy + y^2\right) = \frac{d}{dx}\left((\tan(x))^2\right)$$

$$2x + \left(3x\frac{dy}{dx} + 3y\right) + 2y\frac{dy}{dx} = 2\tan(x)\sec^2(x)$$

$$3x\frac{dy}{dx} + 2y\frac{dy}{dx} = 2\tan(x)\sec^2(x) - 2x - 3y$$

$$\frac{dy}{dx}\left(3x + 2y\right) = 2\tan(x)\sec^2(x) - 2x - 3y$$

$$\boxed{\frac{dy}{dx} = \frac{2\tan(x)\sec^2(x) - 2x - 3y}{3x + 2y}}$$

answer: