MATH 141: QUIZ 5 SECTIONS 3.6 AND 3.7

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No phone or calculator. You must show all work to receive full credit. Be sure to make reasonable simplifications.

1. **(5 points)** Find the *second* derivative, $f''(x)$, of $f(x) = \cot(4x)$.

$$f'(x) = -\csc^2(4x)\cdot(4)$$
$$= -4\csc^2(4x)$$
$$= -4(\csc(4x))^2$$

$$f''(x) = -8(\csc(4x))(-\csc(4x)\cot(4x))(4)$$
$$= \boxed{32\csc^2(4x)\cot(4x)}$$

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2. **(5 points)** Using implicit differentiation, find $\frac{dy}{dx}$ from the equation below:

$$x^2y = 5y + x - 2$$

$$2xy + x^2\frac{dy}{dx} = 5\frac{dy}{dx} + 1$$

$$x^2\frac{dy}{dx} - 5\frac{dy}{dx} = 1 - 2xy$$

$$\frac{dy}{dx}(x^2 - 5) = 1 - 2xy$$

$$\boxed{\frac{dy}{dx} = \frac{1 - 2xy}{x^2 - 5}}$$