

Instructions: (24 points) This quiz consists of 4 problems. Credit is awarded for correct solutions in which you **show your work**. You will have 30 minutes to complete this quiz. You may not use a calculator, textbook, notes, or any outside source while taking this quiz.

(6^{pts}) 1. Find the following derivatives:

$$(a) \frac{d}{dx} \ln(\sin(x)) = \frac{1}{\sin(x)} \frac{d}{dx}(\sin(x)) = \frac{1}{\sin(x)} \cos(x) = \cot(x)$$

$$(b) \frac{d}{dx} e^{7x} = 7e^{7x}$$

$$(c) \frac{d}{dx} (x^2 - 1)^8 = 8(x^2 - 1)^7 \frac{d}{dx} (x^2 - 1) = 16x(x^2 - 1)^7$$

(6^{pts}) 2. Find y' for the implicit equation $x^2y = \cos(x + y)$.

Solution: Differentiating both sides by x :

$$x^2y' + 2xy = -\sin(x + y)(1 + y')$$

Solving for y' yields:

$$y' = -\frac{2xy + \sin(x + y)}{x^2 + \sin(x + y)}.$$

(6pts) 3. Find the following limits:

$$(a) \lim_{x \rightarrow 0} \frac{e^x - 1}{x - 1} = \frac{e^0 - 1}{0 - 1} = \frac{0}{1} = 0$$

$$(b) \lim_{t \rightarrow 1} \frac{t^8 - 1}{t^5 - 1} \stackrel{L'H}{=} \lim_{t \rightarrow 1} \frac{8t^7}{5t^4} = \frac{8}{5}$$

(6pts) 4. *True or False.* If it is true, explain why. If it is false, explain why or given an example that disproves the statement.

$$(a) \text{ **F** } \frac{d}{dx} \cos^2(x) = \left(\frac{d}{dx} \cos(x) \right)^2$$

Solution: The left-hand side is $2 \cos(x) \sin(x)$ while the right-hand side is $(-\sin(x))^2 = \sin^2(x)$.

$$(b) \text{ **F** } \text{ The limit } \lim_{x \rightarrow 2^+} \left(\frac{1}{4 - x^2} + \ln(x - 2) \right) \text{ has an indeterminate form.}$$

Solution: This limit is going to $-\infty - \infty$ which is not an indeterminate form.

$$(c) \text{ **F** } \frac{d}{dx} \arccos(x) = \frac{1}{\sqrt{1 - x^2}}$$

Solution: This is the derivative of $\arcsin(x)$.