Math 131 - Quiz 5

Name **Key**

February 25, 2026

Score _____

Show all work to receive full credit. Supply explanations when necessary.
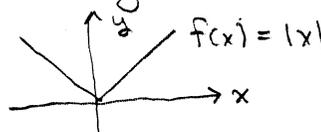
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1. (4 points) Each function below is differentiable everywhere except for at a single point. Say where and how each function fails to be differentiable.

(a) $f(x) = |x|$

AT $X = 0$, THE GRAPH HAS A SHARP PT.
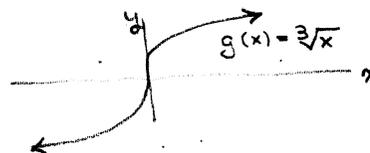
TO THE LEFT OF $X = 0$, $f'(x) = -1$.

TO THE RIGHT OF $X = 0$, $f'(x) = 1$.

(b) $g(x) = \sqrt[3]{x}$

AT $X = 0$, THE GRAPH HAS

• A VERTICAL TANGENT LINE.

$g'(x) = \dfrac{1}{3\sqrt[3]{x^2}}$ ← INF. DISCONT AT $X = 0$

2. (3 points) Determine each derivative.

(a) $\dfrac{d}{dx}\left(\sqrt{x} + x^2 + \dfrac{1}{x^2}\right)$

$= \dfrac{d}{dx}\left(x^{1/2} + x^2 + x^{-2}\right) = \dfrac{1}{2}x^{-1/2} + 2x - 2x^{-3}$

$= \dfrac{1}{2\sqrt{x}} + 2x - \dfrac{2}{x^3}$

(b) $\dfrac{d}{dx}(4x^3 \cos x)$

$= 12x^2 \cos x - 4x^3 \sin x$

3. (3 points) Find an equation of the line tangent to the graph of $f(x) = 5x^2 - 8x + 3$ at the point where $x = 2$.

$f'(x) = 10x - 8$

Slope: $f'(2) = 12$

Point: $x = 2$

$y = f(2) = 20 - 16 + 3$

$= 7$

$y - 7 = 12(x - 2)$

OR

$y = 12x - 17$