Math 131 - Assignment 4

Name _____

September 19, 2024

Score _____

Show all work to receive full credit. Supply explanations when necessary. This assignment is due September 26.

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1. Use the limit definition of the derivative to determine $f'(x)$ when $f(x) = x^2 + x - 3$.

2. Use the limit definition of the derivative to determine $f'(x)$ when $f(x) = x^3$.

3. Use the limit definition of the derivative to determine $f'(x)$ when $f(x) = \dfrac{1}{x^2}$.

Turn over.

4. Think about the graph of $y = \sqrt[3]{x}$. For which of our three reasons does dy/dx fail to exist at $x = 0$?

5. Think about the graph of $y = |\sin x|$. For which of our three reasons does dy/dx fail to exist at $x = 0$?

6. Use differentiation rules (not the limit definition) to determine each derivative.

   (a) $\dfrac{d}{dx}\left(5x^2 + 2x - \sqrt{x} + \dfrac{1}{x^3}\right)$

   (b) $\dfrac{d}{dx}[x^2(2x^2 - 3x)]$

   (c) $\dfrac{d}{d\theta}(2\cos\theta + 7\sin\theta)$

7. Look back at problem 6a. Use the derivative you found there to find the slope of the line tangent to the graph of the function at the point where $x = 1$. Then find an equation for the tangent line itself.

8. Find each point on the graph of $y = x^4 - 2x^2 + 3$ at which the tangent line is horizontal.