

- NO BOOKS
- NO CALCULATORS
- SHOW ALL WORK
- REAFFIRM HONOR CODE

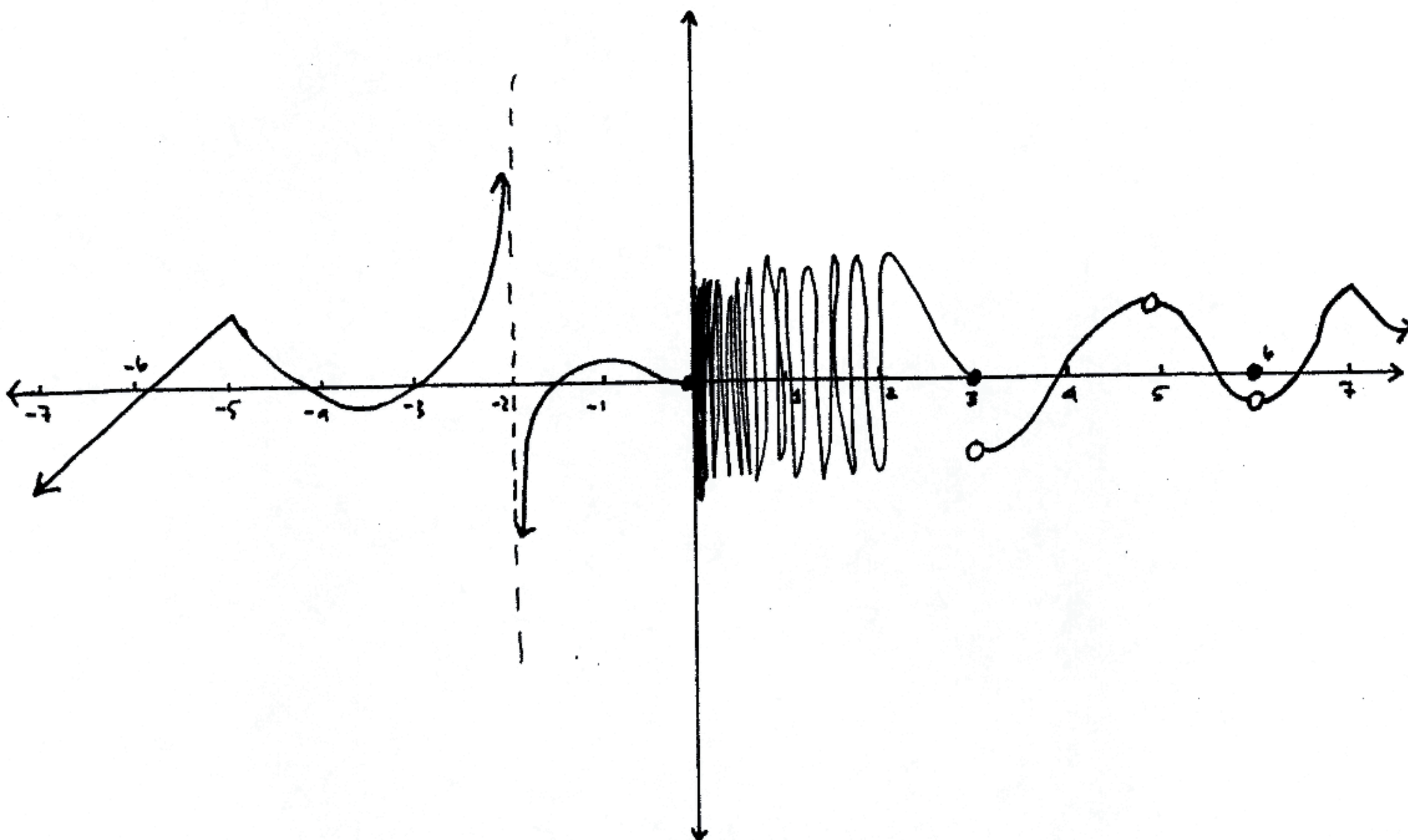
CALCULUS MIDTERM #1

Prof. Hunsicker

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NAME _____

- State the definition of a limit. (10 points)
 - Use this definition to prove that $\lim_{x \rightarrow 2} 5x - 3 = 7$. (5 points)
- Show the function $f(x) = x^5 - 3x + 4$ is continuous on the closed interval $[-2, 2]$. (5 points)
 - Using a theorem we saw, you can prove that $f(x)$ must have a root between -2 and 2 . State that theorem and use it to show this. (10 points)
- Below is the graph of a function $f(x)$. State where $f(x)$ has no limit, is not continuous, and where $f(x)$ is not differentiable. Give a brief explanation of why. (10 points)



- 4) a) State the definition of the derivative of $f(x)$. (10 points)
 b) By drawing a picture and giving its relation to this definition, explain the geometric meaning of the derivative of $f(x)$ at c . (5 points)
 c) Use the definition to calculate the derivative of $f(x)=x^2$. (5 points)

5) Use the limit toolbox to calculate the following limits: (10 points each)

a) $\lim_{x \rightarrow 1} 7(2^{5x-4})$

b) $\lim_{x \rightarrow 0} \frac{\sin(x^2)}{2x^2}$

6) Use the derivative toolbox to calculate the derivatives of the following functions: (10 points each)

a) $f(x) = x^2 \sin(x)$

b) $f(x) = \frac{x+4}{x^{10}}$

EXTRA CREDIT: Explain why the following statements are false.

up to 5 points

a) $\lim_{x \rightarrow 0} \frac{x^2 - 4}{x - 2} = \frac{\lim_{x \rightarrow 0} (x^2 - 4)}{\lim_{x \rightarrow 0} (x - 2)} = \frac{0}{0} = \text{is undefined}$

up to 5 points

b) $\lim_{x \rightarrow 0} \frac{\sin(2x + (\pi/2))}{2x + (\pi/2)} = 1$