

Practice Midterm 1

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1) Determine the following limits (Show work for full credit!)

a) $\lim_{x \rightarrow 2} \frac{x^3 - 8}{x^3 - 2x^2}$

b) $\lim_{x \rightarrow -\infty} \frac{5x + 1}{\sqrt{16x^2 + 3}}$

c) $\lim_{x \rightarrow 1} f(x)$ where $f(x) = \begin{cases} x^2 - 1 & \text{if } x < 1 \\ 2x - 3 & \text{if } x \geq 1 \end{cases}$

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2) Find the domain of the function $f(x) = \sqrt{x(x+2)(x-1)(x-5)}$.

3) Find the inverse function of $f(x) = x^3 - 2$.

4) Find the center and radius of the circle given by the equation $x^2 - 6x + y^2 + 4y - 3 = 0$.

5) Use limits to find the equations of the vertical asymptotes of $f(x) = \frac{x^2-5}{x^2+x-6}$. BE SURE TO JUSTIFY YOUR ANSWERS.

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6) Use the definition of the derivative to find $f'(x)$ for $f(x) = \sqrt{2x^2 + 3}$.

7) Describe the interval(s) on which the function f is continuous where

$$f(x) = \begin{cases} x + 11 & \text{if } x \leq -3 \\ x^2 - 1 & \text{if } -3 < x \leq 2 \\ \frac{1}{x-2} & \text{if } x > 2 \end{cases}$$

8) Either algebraically or geometrically, explain why (use words) there are no numbers x such that the distance between the points $(5, -1)$ and $(x, 4)$ is 3.