

Name: Solution

/ 25

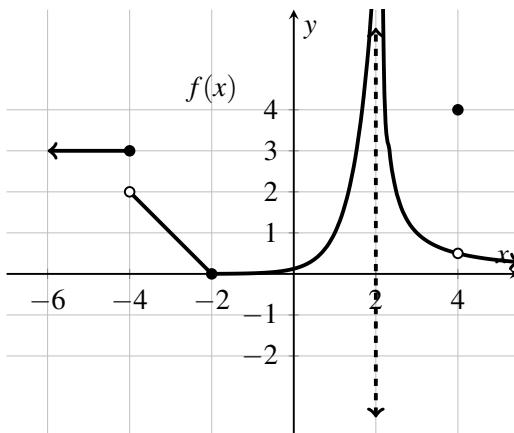
Please circle your instructor's name:

James Gossell

Gordon Williams

There are 25 points possible on this quiz. Any outside materials are not allowed. **For full credit, show all work clearly.**

1. [10 points] Use the graph of the function $f(x)$ to answer each question. If the limit is infinite, indicate that with ∞ or $-\infty$. If the value does not exist or is undefined, write DNE.



a. $\lim_{x \rightarrow -4^-} f(x) = 3$ b. $\lim_{x \rightarrow -4^+} f(x) = 2$ c. $\lim_{x \rightarrow -4} f(x) = \text{DNE}$

d. $\lim_{x \rightarrow 2^+} f(x) = \infty$ e. $f(4) = 4$ f. $\lim_{x \rightarrow 4} f(x) = \frac{1}{2}$

g. Write the domain of $f(x)$: $(-\infty, 2) \cup (2, \infty)$

h. List all x -values for which $f(x)$ is not continuous. For each of your answers, classify the discontinuity as **jump**, **removable**, **infinite**, or **other**.

 $x = -4$, jump $x = 2$, infinite $x = 4$, removable.

2. [5 points] Determine whether the given function is continuous at $x = 0$. Justify your answer using limits.

$$g(x) = \begin{cases} x^2 - e^x, & x < 0 \\ 1 - x, & x \geq 0 \end{cases}$$

$$\lim_{x \rightarrow 0^-} g(x) = \lim_{x \rightarrow 0^-} (x^2 - e^x) = 0 - e^0 = -1$$

$$\lim_{x \rightarrow 0^+} g(x) = \lim_{x \rightarrow 0^+} (1 - x) = 1 - 0 = 1$$

Left and right limits do not agree, so limit DNE.

So not continuous.

3. [8 points] Evaluate the limits algebraically. Show all work.

a. $\lim_{x \rightarrow 3} \frac{x^2 - x - 6}{12 - 4x} = \frac{\cancel{x-3}(x+2)}{\cancel{4}(3-x)} = \lim_{x \rightarrow 3} \frac{x+2}{-4} = -\frac{5}{4}$

b. $\lim_{x \rightarrow 4} \frac{3x - 12}{\sqrt{x} - 2} = \frac{\cancel{3}(x-4)}{\cancel{\sqrt{x}-2}} = \lim_{x \rightarrow 4} \frac{3(x-4)}{\sqrt{x}+2} = \lim_{x \rightarrow 4} \frac{(3x-12)(\sqrt{x}+2)}{x-4} = \lim_{x \rightarrow 4} 3(\sqrt{x}+2) = 3 \cdot 4 = 12$

4. [2 points]

Evaluate the limit below. Circle one answer from Part I and one justification from Part II.

$$\lim_{x \rightarrow 3^-} \frac{2x - 7}{x^2 - 9}$$

Value of the Limit (Circle one)

$-\infty$ $+\infty$ 0

Justification (Circle one) As x approaches 3 from the left...

- (A) ...the numerator is positive and the denominator is slightly bigger than 0.
- (B) ...the numerator is positive and the denominator is slightly smaller than 0.
- (C) ...the numerator is negative and the denominator is slightly bigger than 0.
- (D) ...the numerator is negative and the denominator is slightly smaller than 0.
- (E) ...the limit is 0 because the denominator is equal to 0.