

Practice Test K: Limits, Continuity, IVT

Name: _____

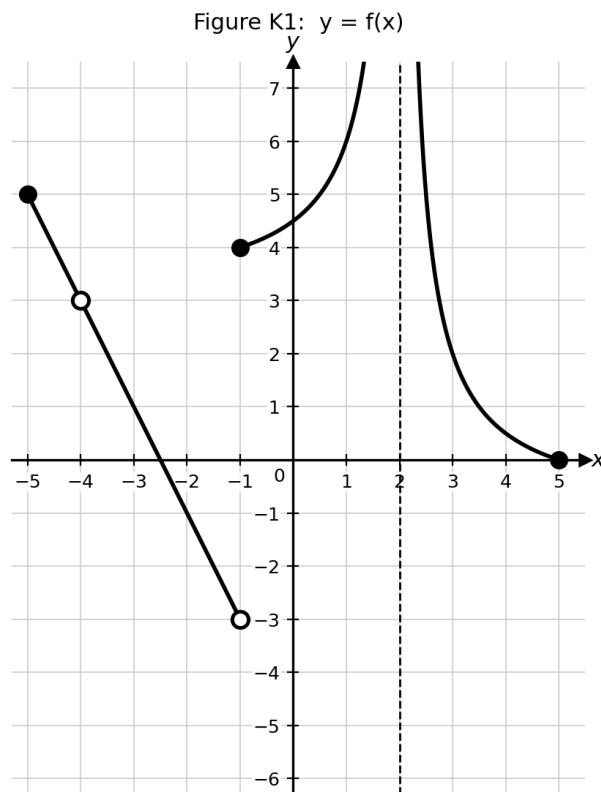
Time: 60 minutes No calculator 100 points

Answer exactly the question asked. Show work on every problem in Parts III–V.

If a limit is infinite, write ∞ or $-\infty$. If a limit does not exist for any other reason, write DNE.

If a function value does not exist, write *undefined*.

Part I. Graph. Questions 1(a)–1(g) refer to Figure K1.



1. Use the figure to find each value.

(a) $\lim_{x \rightarrow -1^+} f(x)$ _____

(b) $\lim_{x \rightarrow -4} f(x)$ _____

(c) $f(-4)$ _____

(d) $\lim_{x \rightarrow 2^+} f(x)$ _____

(e) $\lim_{x \rightarrow 2} f(x)$ _____

(f) $\lim_{x \rightarrow -1} f(x)$ _____

(g) $f(2)$ _____

(2 pts each, 14 pts)

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Part II. Table.

2. The table gives values of g . Assume the pattern continues as x approaches -2 . **(2 each, 6 pts)**

x	-2.1	-2.01	-2.001	-2	-1.999	-1.99	-1.9
$g(x)$	-3.1	-3.01	-3.001	1	0.999	0.99	0.9

- (a) $\lim_{x \rightarrow -2^-} g(x)$ _____ (b) $\lim_{x \rightarrow -2} g(x)$ _____ (c) $g(-2)$ _____

Part III. Algebra. Show work.

3. Evaluate $\lim_{x \rightarrow 1} \frac{x^2 + x - 6}{x^2 - 6x + 8}$, if it exists. **(5 pts)**

4. Evaluate $\lim_{x \rightarrow 10} \frac{\sqrt{x+6} - 4}{x - 11}$, if it exists. **(5 pts)**

5. Evaluate $\lim_{x \rightarrow 2} \frac{x^3 - 4x^2 + 6x - 4}{x^2 + x - 6}$, if it exists. **(6 pts)**

6. Let $g(x) = \frac{x-3}{x-1}$. Evaluate each limit. **(3 each, 9 pts)**

- (a) $\lim_{x \rightarrow 1^-} g(x)$ (b) $\lim_{x \rightarrow 1^+} g(x)$ (c) $\lim_{x \rightarrow 1} g(x)$

7. Let $q(x) = \begin{cases} 2x - 1 & x < 1 \\ 4 - x & x \geq 1 \end{cases}$ (2 each, 10 pts)
- (a) $\lim_{x \rightarrow 4} q(x)$ (b) $\lim_{x \rightarrow 1^-} q(x)$ (c) $\lim_{x \rightarrow 1^+} q(x)$ (d) $\lim_{x \rightarrow 1} q(x)$ (e) $q(1)$

8. Let $w(x) = \frac{\sqrt{x+3} - 2}{x-1}$. Find $w(1)$, if it is defined. (3 pts)

Part IV. Continuity. For 9 and 10, check each of the three conditions in the definition of continuity at a point and state your conclusion.

9. Using Figure K1, determine whether f is continuous at $x = -4$. (6 pts)

10. Let $h(x) = \begin{cases} 3 - x & x < 0 \\ 3x + 3 & x \geq 0 \end{cases}$
- Determine whether h is continuous at $x = 0$. (6 pts)

11. Using Figure K1, is f continuous on the closed interval $[-1, 1]$? Explain. (4 pts)

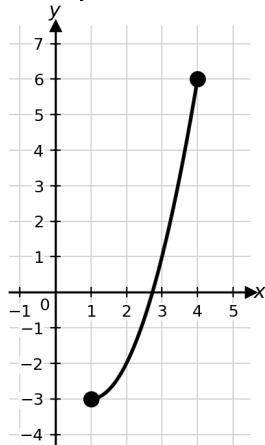
12. Let $q(x) = \frac{x-2}{x^2-3x}$. (3 each, 6 pts)
- (a) Is q continuous on $[0, 2]$? Explain. (b) Is q continuous on $(3, 5]$? Explain.

Part V. Intermediate Value Theorem.

13. The function $g(x) = x^3 + 3x^2 - 2x + 7$ is continuous on $[-1, 2]$. Find $g(-1)$. (2 pts)
14. Let $f(x) = x^2 - 4x$ on the interval $[0, 4]$. Does the Intermediate Value Theorem guarantee a number c in $[0, 4]$ with $f(c) = -3$? If it does, find every such c in $[0, 4]$. (6 pts)

15. Figure K2 shows the graph of s on its domain $[1, 4]$. Does the Intermediate Value Theorem guarantee a number c in $(1, 4)$ with $s(c) = -2$? If it does, find c . Explain. (4 pts)

Figure K2: $y = s(x)$, domain $[1, 4]$



16. True or False. Circle one. (4 each, 8 pts)
- (a) **T** **F** If f is continuous on $[-1, 0]$, $f(-1) = -2$, and $f(0) = 3$, then there is exactly one number c in $(-1, 0)$ with $f(c) = 0$.
- (b) **T** **F** If $g(1) = 4$, $g(4) = -2$, and $g(c) = 0$ for some number c in $[1, 4]$, then g must be continuous on $[1, 4]$.