

Practice Test L: Limits, Continuity, IVT

Name: _____

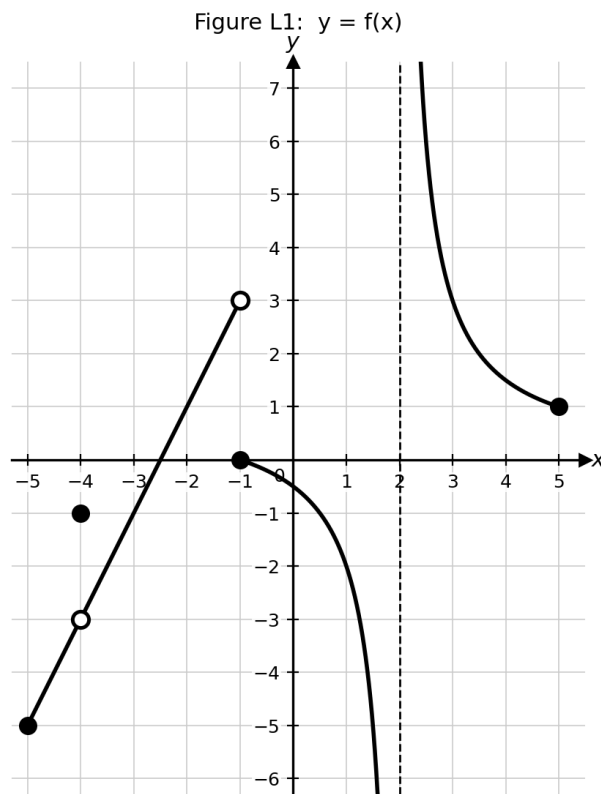
Time: 60 minutes No calculator 100 points

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 L1.



1. Use the figure to find each value.

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

(b) $f(-4)$ _____

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

(d) $f(2)$ _____

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

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

(g) $\lim_{x \rightarrow 2^-} f(x)$ _____

(2 pts each, 14 pts)

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Part II. Table.

2. The table gives values of k . Assume the pattern continues as x approaches 3. **(2 each, 6 pts)**

x	2.9	2.99	2.999	3	3.001	3.01	3.1
$k(x)$	10	100	1000	-1	-1000	-100	-10

(a) $\lim_{x \rightarrow 3^-} k(x)$ _____ (b) $\lim_{x \rightarrow 3} k(x)$ _____ (c) $k(3)$ _____

Part III. Algebra. Show work.

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

4. Evaluate $\lim_{x \rightarrow 9} \frac{\sqrt{x} - 3}{x - 8}$, if it exists. **(5 pts)**

5. Evaluate $\lim_{x \rightarrow -1} \frac{x^3 + 4x^2 + 4x + 1}{x^2 + x}$, if it exists. **(6 pts)**

6. Let $R(x) = \frac{x+1}{x^2-16}$. Evaluate each limit. **(3 each, 9 pts)**

(a) $\lim_{x \rightarrow 4^-} R(x)$ (b) $\lim_{x \rightarrow 4^+} R(x)$ (c) $\lim_{x \rightarrow 4} R(x)$

7. Let $p(x) = \begin{cases} x^2 + 3 & x < 0 \\ x^2 & x \geq 0 \end{cases}$ (2 each, 10 pts)
- (a) $\lim_{x \rightarrow 2} p(x)$ (b) $\lim_{x \rightarrow 0^-} p(x)$ (c) $\lim_{x \rightarrow 0^+} p(x)$ (d) $\lim_{x \rightarrow 0} p(x)$ (e) $p(0)$

8. Let $r(x) = \frac{\sqrt{x-1} - 2}{x-5}$. Find $r(5)$, 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 L1, determine whether f is continuous at $x = -1$. (6 pts)

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

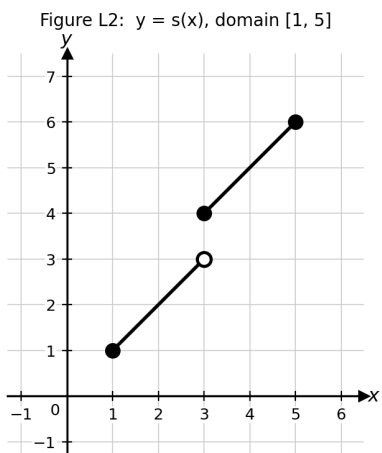
11. Using Figure L1, is f continuous on the closed interval $[-1, 1]$? Explain. (4 pts)

12. Let $q(x) = \frac{x-3}{x^2-7x+6}$. (3 each, 6 pts)
- (a) Is q continuous on $(6, 8]$? Explain. (b) Is q continuous on $[4, 6]$? Explain.

Part V. Intermediate Value Theorem.

13. The function $g(x) = x^3 - 4x^2 - 3x - 6$ is continuous on $[-2, 2]$. Find $g(2)$. (2 pts)
14. Let $f(x) = x^2 + 3x$ on the interval $[2, 5]$. Does the Intermediate Value Theorem guarantee a number c in $[2, 5]$ with $f(c) = 28$? If it does, find every such c in $[2, 5]$. (4 pts)

15. Figure L2 shows the graph of s on its domain $[1, 5]$. Does the Intermediate Value Theorem guarantee a number c in $(1, 5)$ with $s(c) = 3.5$? If it does, find c . Explain. (4 pts)



16. True or False. Circle one. (4 each, 8 pts)
- (a) **T** **F** If f is continuous on $[-2, 1]$, $f(-2) = -1$, and $f(1) = 7$, then $f(c) = 0$ for at least one number c in $(-2, 1)$.
- (b) **T** **F** If g is continuous on $[0, 6]$, $g(0) = -6$, and $g(6) = -2$, then there is at least one number c in $[0, 6]$ with $g(c) = 0$.