

Practice Test I: Limits, Continuity, IVT

Name: _____

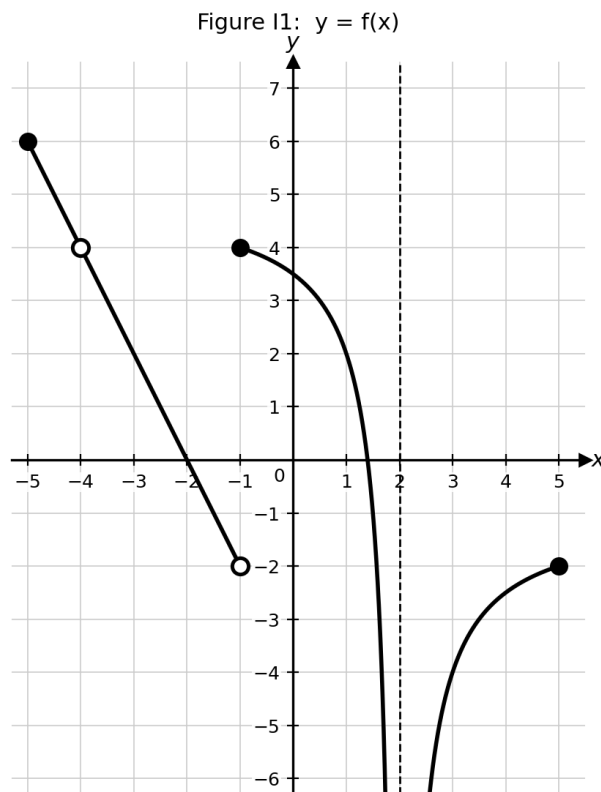
Time: 60 minutes No calculator 100 points

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 I1.



1. Use the figure to find each value.

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

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

(c) $f(-4)$ _____

(d) $f(2)$ _____

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

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

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

(2 pts each, 14 pts)

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Part II. Table.

2. The table gives values of m . Assume the pattern continues as x approaches -1 . **(2 each, 6 pts)**

x	-1.1	-1.01	-1.001	-1	-0.999	-0.99	-0.9
$m(x)$	2.01	2.0001	2.000001	undefined	2.000001	2.0001	2.01

- (a) $\lim_{x \rightarrow -1^-} m(x)$ _____ (b) $\lim_{x \rightarrow -1} m(x)$ _____ (c) $m(-1)$ _____

Part III. Algebra. Show work.

3. Evaluate $\lim_{x \rightarrow -1} \frac{x^2 - 6x + 8}{x^2 - 5x + 4}$, if it exists. **(5 pts)**

4. Evaluate $\lim_{x \rightarrow 22} \frac{\sqrt{x+3} - 4}{x - 12}$, if it exists. **(5 pts)**

5. Evaluate $\lim_{x \rightarrow 3} \frac{x^3 - 11x + 6}{x^2 - 4x + 3}$, if it exists. **(6 pts)**

6. Let $g(x) = \frac{x+4}{x-2}$. Evaluate each limit. **(3 each, 9 pts)**

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

7. Let $q(x) = \begin{cases} 2x - 1 & x < 1 \\ 3x - 3 & x \geq 1 \end{cases}$ (2 each, 10 pts)
- (a) $\lim_{x \rightarrow 3} q(x)$ (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 $w(x) = \frac{\sqrt{x-2}-3}{x-11}$. Find $w(11)$, 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 I1, determine whether f is continuous at $x = -1$. (6 pts)

10. Let $k(x) = \begin{cases} 3 - x & x < 2 \\ 3 & x = 2 \\ 5 - 2x & x > 2 \end{cases}$

Determine whether k is continuous at $x = 2$. (6 pts)

11. Using Figure I1, is f continuous on the closed interval $[-1, 1]$? Explain. (4 pts)

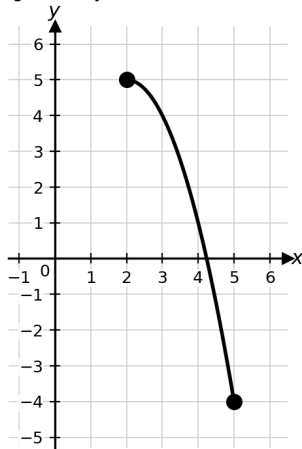
12. Let $q(x) = \frac{x-3}{x^2+3x}$. (3 each, 6 pts)
- (a) Is q continuous on $[-2, 0]$? Explain. (b) Is q continuous on $(0, 2]$? Explain.

Part V. Intermediate Value Theorem.

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

15. Figure I2 shows the graph of r on its domain $[2, 5]$. Does the Intermediate Value Theorem guarantee a number c in $[2, 5]$ with $r(c) = 4$? If it does, find c . Explain. (4 pts)

Figure I2: $y = r(x)$, domain $[2, 5]$



16. True or False. Circle one. (4 each, 8 pts)
- (a) **T** **F** If f is continuous on $[5, 6]$, $f(5) = -5$, and $f(6) = 3$, then there is at least one number c in $[5, 6]$ with $f(c) = -3$.
- (b) **T** **F** If $g(-1) = 4$, $g(1) = -2$, and $g(c) = 0$ for some number c in $(-1, 1)$, then g must be continuous on $[-1, 1]$.