

Practice Test E: Answer Key and Rubric

Tutor copy. Every answer was checked by symbolic computation (SymPy). All problems are original; see the notes file for provenance. Prepared with assistance from Claude, an AI model made by Anthropic.

General grading rules

- **Answer-only items** (Part I, Part II, Q13, Q16): all or nothing.
- **Infinite limits.** The instruction box tells students to write ∞ or $-\infty$. “DNE” for a limit whose answer is ∞ or $-\infty$ earns 1 point of the item’s value. A wrong sign earns 0. Where one side is ∞ and the other $-\infty$, the answer is DNE and “ ∞ ” earns 0.
- **Function-value items** (Q1 value parts, Q2(c), Q7(e), Q8, Q13): writing the *limit* where the function value was asked earns 0. “Undefined,” “not defined,” or “does not exist” are all accepted for an undefined value.
- **Show-work items** (Parts III–V): a bare correct answer earns at most half credit.
- **Method is not graded for efficiency.** A correct answer reached by long but valid algebra gets full credit. The time it costs is the penalty.

Test E

Item	Answer	Rubric / trap
1(a)	undefined	$f(-2)$. <i>Trap</i> : function value; read the closed dot (or its absence), not the curve.
1(b)	4	$\lim_{x \rightarrow 1^-} f(x)$.
1(c)	DNE	$\lim_{x \rightarrow 1} f(x)$. One-sided limits differ.
1(d)	-3	$\lim_{x \rightarrow 4} f(x)$.
1(e)	DNE	$\lim_{x \rightarrow -2} f(x)$. One-sided limits differ.
1(f)	$-\infty$	$\lim_{x \rightarrow -2^+} f(x)$.
1(g)	4	$f(4)$. <i>Trap</i> : function value; read the closed dot (or its absence), not the curve.
2(a)	8	<i>Trap</i> : “+” means from the right: the right half of the table.
2(b)	8	
2(c)	1	Function value read directly from the middle column.
3	$\frac{7}{5}$	Direct substitution; 2 setup, 3 value. <i>Trap</i> : the shared factor $(x - 1)$ pulls students into factoring, which also works but costs time.
4	$\frac{1}{2}$	Direct substitution. “0/0,” “undefined,” “DNE”: 0 pts. Rationalizing is valid but slow.
5	$-\frac{3}{4}$	1 pt notes 0/0; 3 pts synthetic division by -1 on 1, 0, 0, 1 giving $x^2 - x + 1$, and denominator $(x + 1)(x - 3)$; 2 pts value. <i>Trap</i> : zero placeholder(s).
6	(a) ∞ (b) $-\infty$ (c) DNE	3 each; sign reasoning required for full credit.
7	(a) -2 (b) 0 (c) 2 (d) DNE (e) -3	2 each. <i>Trap in (a)</i> : $x = 6$ uses the second piece; the first piece gives -4. <i>Trap in (e)</i> : function value.
8	undefined	$\frac{0}{0}$. <i>Trap</i> : simplifying gives the limit 27; that answer earns 0.
9	Not continuous	(1) $f(4) = 4$; (2) $\lim_{x \rightarrow 4} f(x) = -3$; (3) $-3 \neq 4$. 2 pts per condition.

Item	Answer	Rubric / trap
10	Not continuous	(1) $h(3) = 1$; (2) left 0, right 0, limit 0; (3) $0 \neq 1$. Only condition 3 fails. 2 pts per condition.
11	Yes	At the endpoint $x = 1$ the definition needs continuity from the left: $\lim_{x \rightarrow 1^-} f(x) = 4$ and $f(1) = 4$. The jump is on the side outside the interval. 2 answer, 2 reason.
12	(a) No (b) Yes	Denominator zero at $-4, 6$. Each part: 1 answer, 2 reason. <i>Trap</i> : the numerator zero $x = 4$ is irrelevant; watch closed versus open brackets.
13	-5	<i>Trap</i> : IVT heading; only a value is asked. Watch signs of negative inputs.
14	Yes; $c = -2$	2 continuity (polynomial); 2 $f(-4) = 12$, $f(-1) = 0$, and 2 is between; 2 solve $f(x) = 2$: $x = -2$ or $x = 1$, keep -2 only.
15	Yes; $c = 2$	r is continuous on $[1, 4]$, $r(1) = 5$, $r(4) = -4$, and 4 is between. The graph passes through $(2, 4)$. 2 answer, 2 reason.
16(a)	F	False. The IVT gives <i>at least</i> one; a continuous zigzag can cross 0 three times. <i>Trap</i> : the word “exactly.”
16(b)	T	True. Continuous, with a negative value at one end and a positive value at the other.

Points: $14 + 6 + 5 + 5 + 6 + 9 + 10 + 3 + 6 + 6 + 4 + 6 + 2 + 6 + 4 + 8 = 100$.

Interval notation in IVT items. Q15 and Q16(b) use a closed interval $[a, b]$ for c ; Q14 and Q16(a) use the open interval (a, b) . The mix is deliberate. In every item the target value differs from both endpoint values, so no endpoint can be a solution and the choice of bracket never changes an answer.