

Practice Test I: 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 I

Item	Answer	Rubric / trap
1(a)	$-\infty$	$\lim_{x \rightarrow 2} f(x)$. Both sides go the same way. <i>Trap</i> : reflexive “DNE” (1 pt).
1(b)	4	$\lim_{x \rightarrow -4} f(x)$.
1(c)	undefined	$f(-4)$. <i>Trap</i> : function value; read the closed dot (or its absence), not the curve.
1(d)	undefined	$f(2)$. <i>Trap</i> : function value; read the closed dot (or its absence), not the curve.
1(e)	$-\infty$	$\lim_{x \rightarrow 2^-} f(x)$.
1(f)	-2	$\lim_{x \rightarrow -1^-} f(x)$.
1(g)	DNE	$\lim_{x \rightarrow -1} f(x)$. One-sided limits differ.
2(a)	2	<i>Trap</i> : “ $-$ ” means from the left: the left half of the table.
2(b)	2	
2(c)	undefined	Function value read directly from the middle column.
3	$\frac{3}{2}$	Direct substitution; 2 setup, 3 value. <i>Trap</i> : the shared factor $(x - 4)$ pulls students into factoring, which also works but costs time.
4	$\frac{1}{10}$	Direct substitution. “0/0,” “undefined,” “DNE”: 0 pts. Rationalizing is valid but slow.
5	8	1 pt notes 0/0; 3 pts synthetic division by 3 on 1, 0, -11 , 6 giving $x^2 + 3x - 2$, and denominator $(x - 3)(x - 1)$; 2 pts value. <i>Trap</i> : zero placeholder(s).
6	(a) $-\infty$ (b) ∞ (c) DNE	3 each; sign reasoning required for full credit.
7	(a) 6 (b) 1 (c) 0 (d) DNE (e) 0	2 each. <i>Trap in (a)</i> : $x = 3$ uses the second piece; the first piece gives 5. <i>Trap in (e)</i> : function value.
8	undefined	$\frac{0}{0}$. <i>Trap</i> : simplifying gives the limit $\frac{1}{6}$; that answer earns 0.

Item	Answer	Rubric / trap
9	Not continuous	(1) $f(-1) = 4$; (2) left limit -2 , right limit 4 , so the limit does not exist; (3) fails. 2 pts per condition.
10	Not continuous	(1) $k(2) = 3$; (2) left 1 , right 1 , limit 1 ; (3) $1 \neq 3$. Only condition 3 fails. 2 pts per condition.
11	Yes	At the endpoint $x = -1$ the definition needs continuity from the right: $\lim_{x \rightarrow -1^+} f(x) = 4$ 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 $-3, 0$. Each part: 1 answer, 2 reason. <i>Trap</i> : the numerator zero $x = 3$ is irrelevant; watch closed versus open brackets.
13	1	<i>Trap</i> : IVT heading; only a value is asked. Watch signs of negative inputs.
14	Yes; $c = 4$	2 continuity (polynomial); 2 $f(2) = -2$, $f(7) = 28$, and 4 is between; 2 solve $f(x) = 4$: $x = 4$ or $x = -1$, keep 4 only.
15	Yes; $c = 3$	r is continuous on $[2, 5]$, $r(2) = 5$, $r(5) = -4$, and 4 is between. The graph passes through $(3, 4)$. 2 answer, 2 reason.
16(a)	T	True. The hypotheses of the IVT hold and the target is strictly between the endpoint values.
16(b)	F	False. This is the converse of the IVT. A function with a jump elsewhere in the interval can still take the value. <i>Trap</i> : treating the IVT as an if-and-only-if.

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(a) use a closed interval $[a, b]$ for c ; Q14 and Q16(b) 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.