1.4 / Practice workbook

Limits from Tables

Practice

Problems 1–7 / Show your reasoning

1 Selected values of f are given in the table. Which of the following must be true?
I. $f(4) = 1$
II. $\lim_{x \to 4} f(x) = 6$
III. $\lim_{x \to 4} f(x) \neq f(4)$

x	3.9	3.99	3.999	4	4.001	4.01	4.1
$f(x)$	5.8	5.98	5.998	1	6.002	6.02	6.2

A. I only
B. II only
C. I and II only
D. I, II, and III

2 Selected values of f are given in the table. What does the table suggest about $\lim_{x \to 0} f(x)$?

x	-0.1	-0.01	-0.001	0.001	0.01	0.1
$f(x)$	1990	1999	1999.9	2000.1	2001	2010

A. ∞
B. 2000
C. nonexistent
D. 2000.1

3 A student will make a table of values to estimate $\lim_{x \to 5} f(x)$, where $f(5)$ is not defined. Which set of x-values gives the best evidence?

A. $4,\ 4.5,\ 5.5,\ 6$

B. $5.1,\ 5.01,\ 5.001,\ 5.0001$

C. $4.9,\ 4.99,\ 5.01,\ 5.1$

D. $4.9,\ 4.99,\ 4.999,\ 5.001,\ 5.01,\ 5.1$

1.4 / AP-style free response

Problem 4 ➤ */ Show the work and the reasons a grader looks for.*

Selected values of g are given in the table. Base your answers on what the table suggests.

x	-1.1	-1.01	-1.001	-0.999	-0.99	-0.9
$g(x)$	10	100	1000	3000	300	30

(a) Describe the one-sided limits at $x = -1$.

(b) Is $\lim_{x \to -1} g(x)$ a real number? Explain.

(c) Describe the graph of g near $x = -1$.

1.4 / AP-style free response

Problem 5 ➤ */ Show the work and the reasons a grader looks for.*

Selected values of f are given in the table, and $g(x) = \dfrac{1}{f(x)}$.

x	1.9	1.99	1.999	2	2.001	2.01	2.1
$f(x)$	0.5	0.05	0.005	4	-0.005	-0.05	-0.5

(a) Estimate $\lim_{x \to 2} f(x)$.

(b) Estimate $\lim_{x \to 2^-} g(x)$.

(c) Does the table suggest $\lim_{x \to 2} g(x) = \infty$?

6 The table gives selected values of g for $x < 3$ only. Which of the following, together with the table, gives the best evidence that $\lim_{x \to 3} g(x) = 8$?

x	2.9	2.99	2.999
$g(x)$	7.7	7.97	7.997

A. $g(3) = 8$
B. $\lim_{x \to 3^-} g(x) = 8$
C. $\lim_{x \to 3^+} g(x) = 8$
D. $g(3.1) = 8.3$

1.4 / AP-style free response

Problem 7 ➤ */ Show the work and the reasons a grader looks for.*

Let $f(x) = \dfrac{x^3 - 1}{x - 1}$.

(a) Make a table of values of $f(x)$ for $x = 0.9,\ 0.99,\ 0.999$ and $x = 1.001,\ 1.01,\ 1.1$.

(b) What does the table suggest about $\lim_{x \to 1} f(x)$?

(c) Why does the table have no column at $x = 1$?

1.4 / Answer key

Limits from Tables

1 (A)

2 (B)

3 (D)

4 (a) The table suggests both are ∞: on each side the values grow without bound; (b) No: the table suggests $\lim_{x \to -1} g(x) = \infty$. Both sides grow without bound, the same way, and ∞ is not a real number; (c) The table suggests a vertical asymptote at $x = -1$, with the graph rising without bound on both sides

5 (a) 0; (b) The table suggests ∞: from the left, $f(x)$ is a small positive number, so $g(x) = \frac{1}{f(x)}$ grows without bound; (c) No: the table suggests that from the right, $f(x)$ is a small negative number, so $g(x) \to -\infty$; the two sides go opposite ways, so the limit does not exist

6 (C)

7 (a) $2.71, 2.9701, 2.997001; 3.003001, 3.0301, 3.31$; (b) The table suggests $\lim_{x \to 1} f(x) = 3$: both sides head to 3; (c) $f(1)$ is not defined (the bottom is 0). The limit does not use $x = 1$ anyway: $x \to 1$ means $x \neq 1$.