

Station 1 Limits at Infinity

Section 2.7

9-29 odd, 35-41 odd

Station 1

Limits at Infinity Practice

$$22) \lim_{x \rightarrow \infty} \frac{x+2}{\sqrt{9x^2+1}}$$

$$23) \lim_{x \rightarrow +\infty} \frac{\sqrt{9x^6-x}}{x^3+1}$$

$$24) \lim_{x \rightarrow -\infty} \frac{\sqrt{9x^6-x}}{x^3+1}$$

$$25) \lim_{x \rightarrow \infty} (\sqrt{9x^2+x} - 3x)$$

$$26) \lim_{x \rightarrow -\infty} (x + \sqrt{x^2+2x})$$

$$27) \text{ * Challenge* } \lim_{x \rightarrow \infty} (\sqrt{x^2+ax} - \sqrt{x^2+bx})$$

Station 1

Find the Horizontal Asymptote for $f(x)$. Remember to check ∞ and $-\infty$!

$$39) f(x) = \frac{2x+1}{x-2}$$

$$40) f(x) = \frac{x^2+1}{x^2-3x-2}$$

$$41) f(x) = \frac{2x^2+x-1}{x^2+x-2}$$

$$42) f(x) = \frac{1+x^4}{x^2-x^4}$$

$$43) f(x) = \frac{x^3-x}{x^2-6x+5}$$

$$44) f(x) = \frac{2e^x}{e^x-5}$$

Station 2

Defend Understanding of Limits

1) Try Defense for 10 min... Analyze

Try to write about limits and make connections to the other ideas learned in this class.

After time is up look at other half to see a possible outline for a defense.

Outline of defense

Start with the formal definition of a limit (epsilon/delta)

Explain the concept of a limit (one-sided and concept of “at” versus “close to”)

Connect to a visual

Explain how to find limits

Include:

- a. Trig Limits
- b. Infinity is D.N.E.
- c. Purpose of limit theorems and substitution
- d. Indeterminate form ($\neq/0$ and $0/0$)

Why: Used to find...

1. Horizontal Asymptote,
2. Vertical Asymptote
3. Continuous and Discontinuous forms

$$\text{Prove } \lim_{x \rightarrow 0} \frac{\sin x}{x}$$

Connections: Throughout your explanation above thread the concept of reaching a value versus getting close to a value and role of infinity in evaluating limits.

Station 3

AP Style Questions

42. $\lim_{x \rightarrow 0} (1 + 2x)^{\csc x} =$

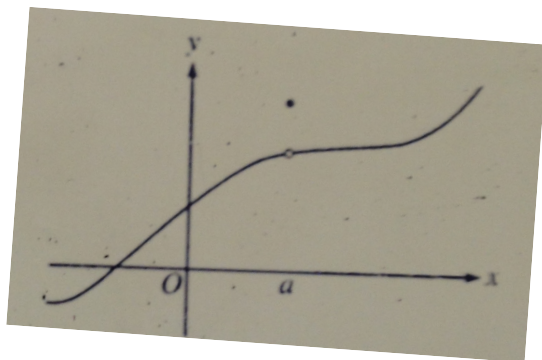
- (A) 0
- (B) 1
- (C) 2
- (D) e
- (E) e^2

3. $\lim_{n \rightarrow \infty} \frac{3n^3 - 5n}{n^3 - 2n^2 + 1}$ is

- (A) -5
- (B) -2
- (C) 1
- (D) 3
- (E) nonexistent

12. If $f(x) = \begin{cases} \ln x & \text{for } 0 < x \leq 2 \\ x^2 \ln x & \text{for } x > 2 \end{cases}$ then $\lim_{x \rightarrow 2} f(x)$ is

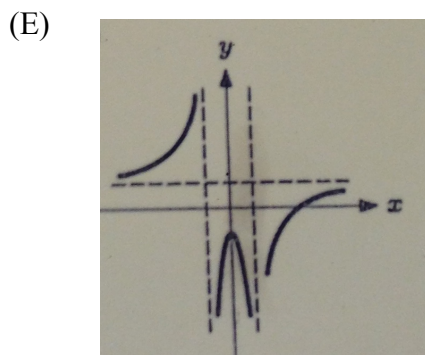
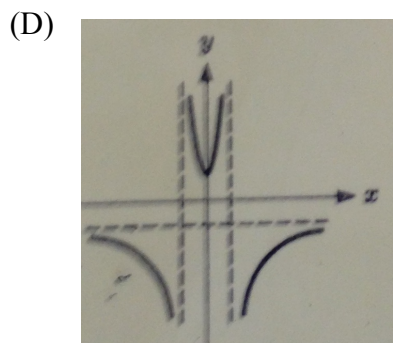
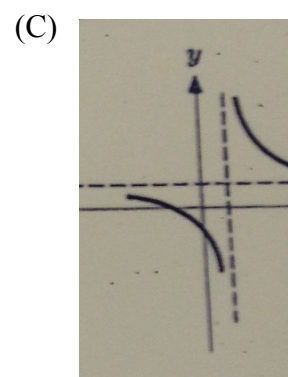
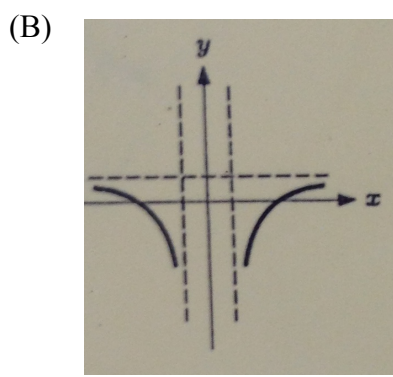
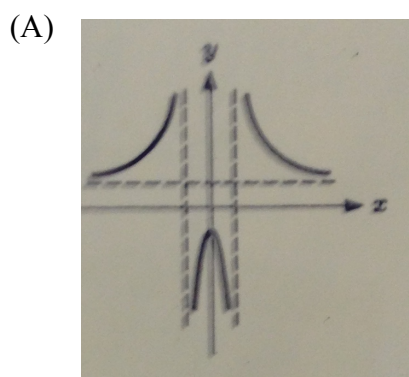
- (A) $\ln 2$
- (B) $\ln 8$
- (C) $\ln 16$
- (D) 4
- (E) nonexistent

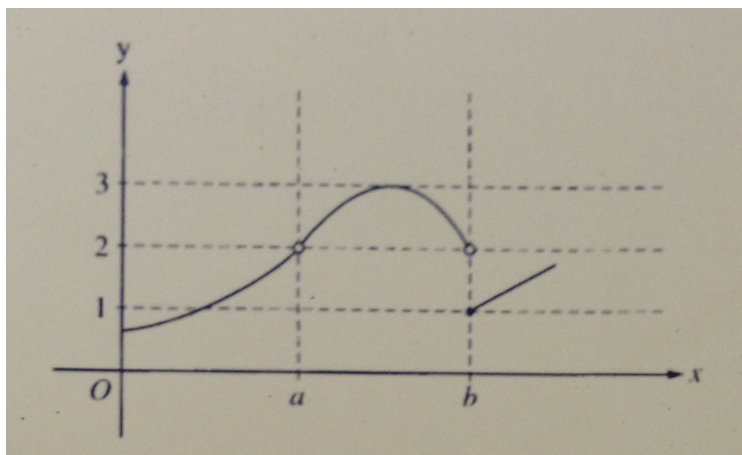


76. The graph of a function f is shown above. Which of the following statements about f is false?

- (A) f is continuous at $x = a$
- (B) f has a relative maximum at $x = a$
- (C) $x = a$ is in the domain of f
- (D) $\lim_{x \rightarrow a^+} f(x)$ is equal to $\lim_{x \rightarrow a^-} f(x)$
- (E) $\lim_{x \rightarrow a} f(x)$ exists

7. Which one of the following graphs resemble $y = \frac{|x|+1}{|x|-1}$?





15. The graph of the function f is shown above. Which of the following statements about f is true?

- (A) $\lim_{x \rightarrow a} f(x) = \lim_{x \rightarrow b} f(x)$
- (B) $\lim_{x \rightarrow a} f(x) = 2$
- (C) $\lim_{x \rightarrow b} f(x) = 2$
- (D) $\lim_{x \rightarrow b} f(x) = 1$
- (E) $\lim_{x \rightarrow a} f(x)$ does not exist

21. $\lim_{x \rightarrow 1} \frac{x}{\ln x}$ is

- (A) 0
- (B) $\frac{1}{e}$
- (C) 1
- (D) e
- (E) nonexistent

5. The graph of $y = \frac{\sin x}{x}$ has

- I. A vertical asymptote at $x = 0$
- II. A horizontal asymptote at $y = 0$
- III. A infinite number of zeros

- (A) I only
- (B) II only
- (C) III only
- (D) I and III only
- (E) II and III only

2. $\lim_{x \rightarrow 3} \frac{(3-x)^2}{(x-3)}$ is

- (A) 0
- (B) -2
- (C) 1
- (D) -1
- (E) nonexistent

34. Which of the following functions grow faster than e^x as $x \rightarrow \infty$?

- (A) x^4
- (B) $\ln x$
- (C) e^{-x}
- (D) 3^x
- (E) $\frac{1}{2}e^x$

14. A function $f(x)$ has a vertical asymptote at $x = 2$. The derivative is positive for all $x \neq 2$. Which statement is true?

- I. $\lim_{x \rightarrow 2} f(x) = +\infty$
- II. $\lim_{x \rightarrow 2^+} f(x) = +\infty$
- III. $\lim_{x \rightarrow 2^-} f(x) = +\infty$

- (A) I only (B) II only (C) III only (D) I and II only (E) I, II, and III

Station 4 Limits and Continuity

Section 2.4 worksheets

Problems 55, 57, 58, 59, 62, 63, 65, 82

Section 2.5 worksheets

Problems 1-53

Level *** 55-58

Station 5 Trig Limits

17-49 odd