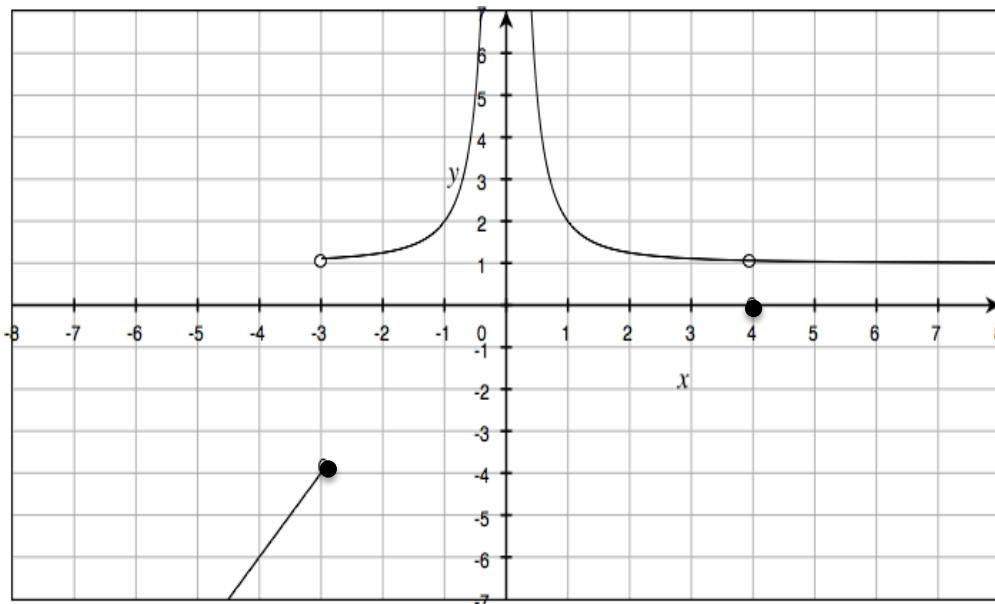


AB Chapter 1 Review Worksheet

1. The graph of $f(x)$ is shown below. The graph of $f(x)$ has a vertical asymptote at $x = 0$ and a horizontal asymptote at $y = 0$. Evaluate each limit or *explain* why the limits do not exist or the values are undefined.



- a) $f(4)$
- b) $f(-3)$
- c) $f(0)$
- d) $\lim_{x \rightarrow -3} f(x)$
- e) $\lim_{x \rightarrow 0} f(x)$
- f) $\lim_{x \rightarrow 4} f(x)$
- g) $\lim_{x \rightarrow \infty} f(x)$

2. Evaluate each limit or *explain* why the does not exist.

a) $\lim_{x \rightarrow 0} \frac{\sin x(1 - \cos x)}{x^2}$	b) $\lim_{x \rightarrow 0} \frac{11x}{\sin 4x}$	c) $\lim_{x \rightarrow 2^-} \frac{1}{x-2}$
d) $\lim_{x \rightarrow -5} \frac{x-5}{x^2-25}$	e) $\lim_{x \rightarrow 2} \frac{3x^2-4x-4}{2x^2-8}$	f) $\lim_{x \rightarrow 2} \frac{x-2}{\sqrt{x} - \sqrt{4-x}}$
g) $\lim_{x \rightarrow 0} \frac{1}{2^x}$	h) $\lim_{x \rightarrow \infty} \frac{x^2}{2^x}$	i) $\lim_{x \rightarrow 5} \csc\left(\frac{\pi x}{4}\right)$
j) $\lim_{x \rightarrow \infty} \frac{7x-9}{5-3x}$	k) $\lim_{x \rightarrow -\infty} \frac{\sqrt{9x^2+1}}{2x}$	l) $\lim_{x \rightarrow \infty} \frac{\sqrt{9x^2+1}}{2x}$
m) $\lim_{x \rightarrow \infty} \frac{4}{x+5}$	n) $\lim_{x \rightarrow -\infty} \frac{7x^2-9}{4x+3}$	o) $\lim_{x \rightarrow -6} \frac{ x+6 }{x+6}$
p) $\lim_{x \rightarrow -\infty} \frac{\cos x}{x^4}$	q) $\lim_{\Delta x \rightarrow 0} \frac{(x+\Delta x)^3 - x^3}{\Delta x}$	r) $\lim_{x \rightarrow 0} \sin 2x$
s) $\lim_{x \rightarrow 7} (\sin^2 x + \cos^2 x)$	t) $\lim_{x \rightarrow \infty} \frac{x^3 - 2x^2 + 3x + 1}{x^2 - x + 2}$	u) $\lim_{x \rightarrow \infty} 4x(x+3)^{-2}$
v) $\lim_{x \rightarrow \infty} \frac{4^x}{x}$	w) $\lim_{x \rightarrow \infty} \frac{2^{-x}}{2^x}$	x) $\lim_{x \rightarrow \infty} \sec \frac{1}{x}$
y) $\lim_{x \rightarrow 3} \frac{\frac{1}{x} - \frac{1}{3}}{x-3}$	z) $\lim_{x \rightarrow 3^-} [x+2]$	aa) $\lim_{x \rightarrow \infty} \left(\frac{1}{3}\right)^x$
bb) $\lim_{x \rightarrow -\infty} \left(\frac{1}{3}\right)^x$	cc) $\lim_{x \rightarrow -1} \frac{x}{x^2+1}$	dd) $\lim_{x \rightarrow 2} f(x) \text{ if } f(x) = \begin{cases} 3x^2 - 7, & x \leq 2 \\ x^3 + 1, & x > 2 \end{cases}$

3. $y = \frac{x+4}{x^3 - 16x}$

a) List the x -values at which the function is discontinuous (if any). Describe the type of discontinuity and classify each as removable or nonremovable.

b) List and justify all asymptotes (if any).

4. Find the value of a if $f(x)$ is a continuous function.

$$f(x) = \begin{cases} 3x + a, & x \leq -3 \\ ax^2 + 4, & x > -3 \end{cases}$$

5. Find the values of a and b if $f(x)$ is a continuous function.

$$f(x) = \begin{cases} 2x - 3ax^2, & x < 1 \\ bx - 4, & 1 \leq x \leq 2 \\ x^2 + a, & x > 2 \end{cases}$$

6. $f(x) = x^2 - x - 12$

a) Explain why the IVT applies to $f(x)$ on the interval $[-5, -1]$.

b) Use the IVT to explain why $f(x)$ has a zero on the interval $[-5, -1]$.

c) Find the zero(s) of $f(x)$ guaranteed by the IVT on the interval $[-5, -1]$.

d) Use the IVT to explain why $f(x) = -6$ on the interval $[-5, -1]$.

e) Find the value(s) where $f(x) = -6$ on $[-5, -1]$.

7. If $\lim_{x \rightarrow -1} \frac{2x^2 - ax - 14}{x^2 - 2x - 3}$ exists, find the value of a .

ANSWERS

1.

- a. o
- b. -4
- c. $f(0)$ undefined due to a vertical asymptote at $x=0$.

- d. DNE, since $\lim_{x \rightarrow -3^-} f(x) = -4 \neq \lim_{x \rightarrow -3^+} f(x) = 1$
- e. ∞
- f. 1
- g. o

2.

- a. o
- b. $\frac{11}{4}$

k. $-\frac{3}{2}$

u. o

- c. $-\infty$
- d. DNE, since

$$\lim_{x \rightarrow -5^-} \frac{x-5}{x^2 - 25} = -\infty \neq \lim_{x \rightarrow -5^+} \frac{x-5}{x^2 - 25} \text{ m. o}$$

l. $\frac{3}{2}$

v. ∞

$$\lim_{x \rightarrow -5^-} \frac{x-5}{x^2 - 25} = -\infty \neq \lim_{x \rightarrow -5^+} \frac{x-5}{x^2 - 25} \text{ n. } \infty$$

m. o

w. o

- d. DNE, since

n. ∞

x. 1

- e. 1
- f. $\sqrt{2}$

p. o

y. $-\frac{1}{9}$

- g. 1
- h. o

q. $3x^2$

z. 4

- i. $-\sqrt{2}$
- j. $-\frac{7}{3}$

r. o

aa. o

s. 1

bb. ∞

t. ∞

cc. $-\frac{1}{2}$

dd. DNE, since

dd. DNE, since

dd. DNE, since

3. a. $x = 0, 4$ (nonremovable vertical asymptotes), $x = -4$ (removable hole)

b. $x = 0$; $\lim_{x \rightarrow 0^-} \frac{x+4}{x^3 - 16x} = \infty$ or $\lim_{x \rightarrow 0^+} \frac{x+4}{x^3 - 16x} = -\infty$

$x = 4$; $\lim_{x \rightarrow 4^-} \frac{x+4}{x^3 - 16x} = -\infty$ or $\lim_{x \rightarrow 4^+} \frac{x+4}{x^3 - 16x} = \infty$

$y = 0$; $\lim_{x \rightarrow \infty} \frac{x+4}{x^3 - 16x} = 0$ or $\lim_{x \rightarrow -\infty} \frac{x+4}{x^3 - 16x} = 0$

4. $a = -\frac{13}{8}$

5. $a = \frac{4}{7}$, $b = \frac{30}{7}$

6.

- a. The IVT applies to $f(x)$ on the interval $[-5, -1]$ because $f(x)$ is continuous on the interval $[-5, -1]$.

- b. The IVT guarantees a zero on the interval $[-5, -1]$ since $f(-1) = -10 < 0 < f(-5) = 18$

c. -3

- d. The IVT guarantees $f(x) = -6$ on the interval $[-5, -1]$ since $f(-1) = -10 < -6 < f(-5) = 18$

e. -2

7. $a = 12$