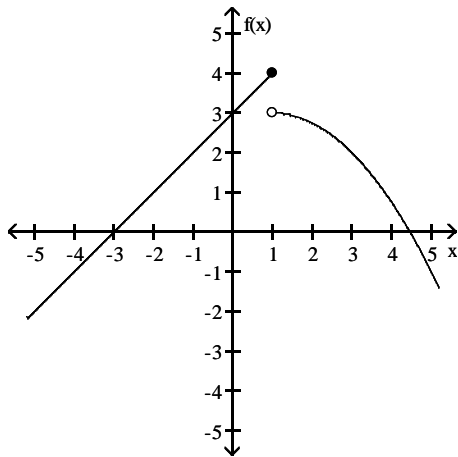


Determine whether the limit exists. If it exists, find its value.

1) $\lim_{x \rightarrow 1^+} f(x)$

1) _____



A) 3

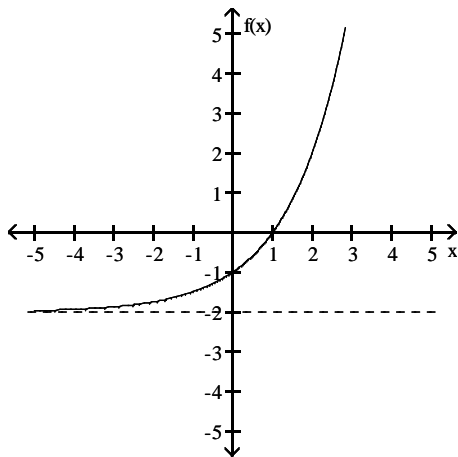
B) Does not exist

C) $3\frac{1}{2}$

D) 4

2) $\lim_{x \rightarrow \infty} f(x)$

2) _____



A) ∞

B) -2

C) Does not exist

D) 0

Complete the table and use the result to find the indicated limit.

3) If $f(x) = x^2 + 8x - 2$, find $\lim_{x \rightarrow 2} f(x)$.

3) _____

x	1.9	1.99	1.999	2.001	2.01	2.1
f(x)						

A)

x	1.9	1.99	1.999	2.001	2.01	2.1
f(x)	16.810	17.880	17.988	18.012	18.120	19.210

; limit = 18.0

B)

x	1.9	1.99	1.999	2.001	2.01	2.1
f(x)	16.692	17.592	17.689	17.710	17.808	18.789

; limit = 17.70

C)

x	1.9	1.99	1.999	2.001	2.01	2.1
f(x)	5.043	5.364	5.396	5.404	5.436	5.763

; limit = ∞

D)

x	1.9	1.99	1.999	2.001	2.01	2.1
f(x)	5.043	5.364	5.396	5.404	5.436	5.763

; limit = 5.40

4) If $f(x) = \frac{x^4 - 1}{x - 1}$, find $\lim_{x \rightarrow 1} f(x)$.

4) _____

x	0.9	0.99	0.999	1.001	1.01	1.1
f(x)						

A)

x	0.9	0.99	0.999	1.001	1.01	1.1
f(x)	3.439	3.940	3.994	4.006	4.060	4.641

; limit = 4.0

B)

x	0.9	0.99	0.999	1.001	1.01	1.1
f(x)	1.032	1.182	1.198	1.201	1.218	1.392

; limit = ∞

C)

x	0.9	0.99	0.999	1.001	1.01	1.1
f(x)	1.032	1.182	1.198	1.201	1.218	1.392

; limit = 1.210

D)

x	0.9	0.99	0.999	1.001	1.01	1.1
f(x)	4.595	5.046	5.095	5.105	5.154	5.677

; limit = 5.10

Use the properties of limits to help decide whether the limit exists. If the limit exists, find its value.

5) $\lim_{x \rightarrow 10} \frac{x^2 - 100}{x - 10}$

5) _____

A) 1

B) Does not exist

C) 10

D) 20

6) $\lim_{x \rightarrow -7} \frac{x^2 + 12x + 35}{x + 7}$

6) _____

A) 168

B) -2

C) 12

D) Does not exist

- 7) $\lim_{x \rightarrow 6} \frac{x^2 + 3x - 54}{x - 6}$ 7) _____
 A) 0 B) Does not exist C) 3 D) 15
- 8) $\lim_{x \rightarrow 1} \frac{x^2 - 1}{x^2 - 3x + 2}$ 8) _____
 A) 0 B) Does not exist C) - 2 D) - 1
- 9) $\lim_{x \rightarrow 0} \frac{\frac{1}{x+4} - \frac{1}{4}}{x}$ 9) _____
 A) Does not exist B) 0 C) $-\frac{1}{16}$ D) $\frac{1}{16}$
- 10) $\lim_{x \rightarrow \infty} \frac{6x^2 + 8x - 6}{-4x^2 + 7}$ 10) _____
 A) $-\frac{7}{6}$ B) 0 C) $-\frac{3}{2}$ D) ∞
- 11) $\lim_{x \rightarrow \infty} \frac{5x^3 + 9x}{4x^4 + 5x^3 + 3}$ 11) _____
 A) 1 B) 0 C) ∞ D) $\frac{5}{4}$

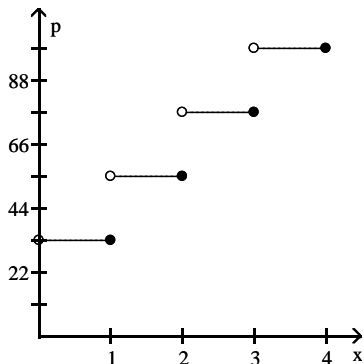
Solve the problem.

- 12) A healthcare program determines that, on average, a new patient can do $P(s)$ hours of exercise per week after completing their training program, where $P(s) = \frac{81 + 57s}{s + 8}$. Find $\lim_{s \rightarrow 7} P(s)$. 12) _____
 A) 60 B) Does not exist C) 32 D) 69
- 13) The cost of a medical exam is $c(x) = 11,000 + 11x$, where x is the of patients per year. The average cost per patient, denoted by $\bar{c}(x)$, is found by dividing $c(x)$ by x . Find $\lim_{x \rightarrow 1000} \bar{c}(x)$. 13) _____
 A) Does not exist B) 13 C) 22 D) 31

14) Because of new patients, transplantations, and deaths, the number of patients receiving dialysis during some part of each week during a one month period varies, and is indicated by the following graph. Let $p(x)$ represent the number of patients in week t . Find the following limits.

14) _____

$$\lim_{x \rightarrow 3^-} p(x), \quad \lim_{x \rightarrow 3^+} p(x), \quad \lim_{x \rightarrow 3} p(x)$$



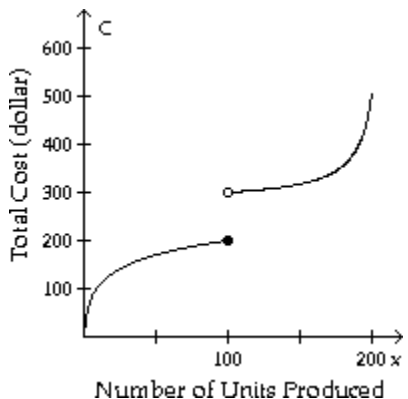
- A) 77; 99; does not exist
C) 77; 77; 77

- B) 77; 99; 77
D) 99; 77; does not exist

15) Suppose the the cost, C , of producing x units of a product can be illustrated by the given graph. Find each limit, if it exists:

15) _____

$$\lim_{x \rightarrow 100^-} p(x), \quad \lim_{x \rightarrow 100^+} p(x), \quad \lim_{x \rightarrow 100} p(x)$$



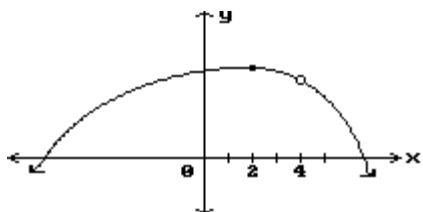
- A) 200; does not exist; does not exist
C) 200; 300; does not exist

- B) 200; 300; 200
D) 200; 200; 200

Find all points where the function is discontinuous.

16)

16) _____



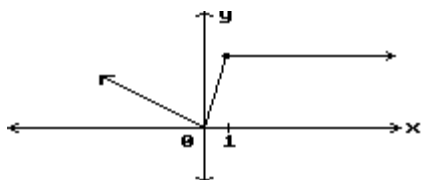
- A) $x = 4, x = 2$

- B) $x = 2$

- C) None

- D) $x = 4$

17)

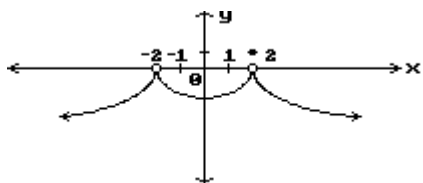


- A) $x = 1$ B) $x = 0$

- C) $x = 0, x = 1$ D) None

17) _____

18)

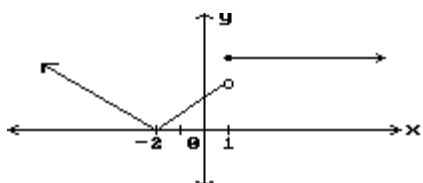


- A) $x = -2, x = 2$ B) None

- C) $x = -2$ D) $x = 2$

18) _____

19)

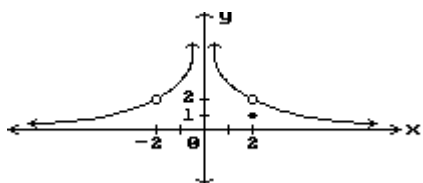


- A) $x = -2, x = 1$ B) $x = 1$

- C) None D) $x = -2$

19) _____

20)



- A) $x = 0, x = 2$
C) $x = -2, x = 0$

- B) $x = -2, x = 0, x = 2$
D) $x = 2$

20) _____

Find all values $x = a$ where the function is discontinuous.

21) $f(x) = \frac{-9x}{(8x - 1)(6 - 4x)}$

- A) $a = \frac{1}{8}, -\frac{3}{2}$

B) Nowhere

- C) $a = 0, \frac{1}{8}, \frac{3}{2}$

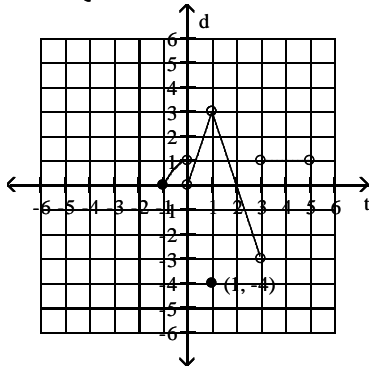
- D) $a = \frac{1}{8}, \frac{3}{2}$

21) _____

Answer the question.

$$22) f(x) = \begin{cases} -x^2 + 1, & -1 \leq x < 0 \\ 3x, & 0 < x < 1 \\ -4, & x = 1 \\ -3x + 6, & 1 < x < 3 \\ 1, & 3 < x < 5 \end{cases}$$

22) _____



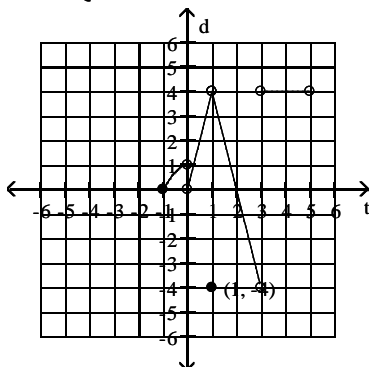
Does $\lim_{x \rightarrow -1^+} f(x) = f(-1)$?

A) Yes

B) No

$$23) f(x) = \begin{cases} -x^2 + 1, & -1 \leq x < 0 \\ 4x, & 0 < x < 1 \\ -4, & x = 1 \\ -4x + 8, & 1 < x < 3 \\ 4, & 3 < x < 5 \end{cases}$$

23) _____



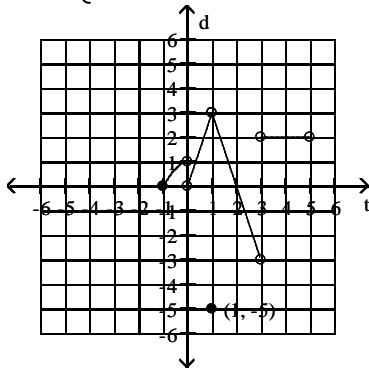
Does $\lim_{x \rightarrow -1^+} f(x)$ exist?

A) No

B) Yes

$$24) f(x) = \begin{cases} -x^2 + 1, & -1 \leq x < 0 \\ 3x, & 0 < x < 1 \\ -5, & x = 1 \\ -3x + 6, & 1 < x < 3 \\ 2, & 3 < x < 5 \end{cases}$$

24) _____



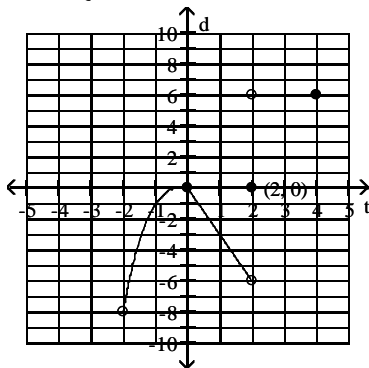
Does $\lim_{x \rightarrow 1} f(x)$ exist?

A) No

B) Yes

$$25) f(x) = \begin{cases} x^3, & -2 < x \leq 0 \\ -3x, & 0 \leq x < 2 \\ 6, & 2 < x \leq 4 \\ 0, & x = 2 \end{cases}$$

25) _____



Is f continuous at $x = 0$?

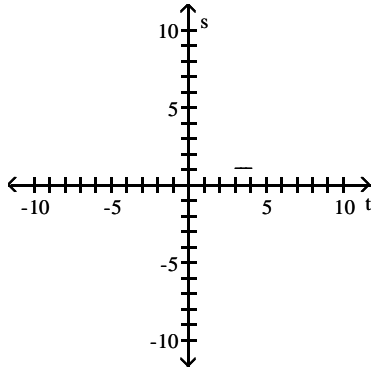
A) Yes

B) No

Solve the problem.

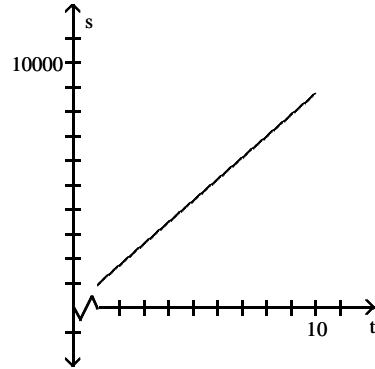
26) A professor's contract promises a 3.5% salary increase each year for 10 years. The professor has an initial salary of \$25,000. The salary function is $f(t) = 25,000(1.035)^{\text{int } t}$, where t is the time, in years, since the professor signed the contract. Graph the salary function. At what values of t is f continuous? 26) _____

A)



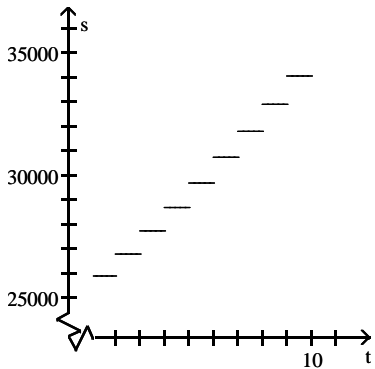
Continuous for $t \neq 1, 2, 3, 4, 5, 6, 7, 8, 9, 10$

B)



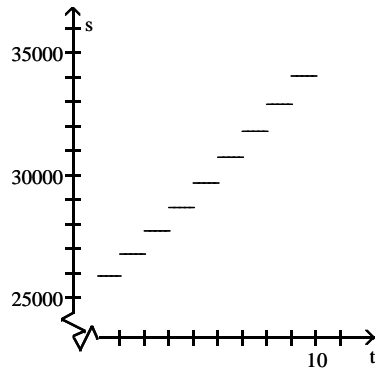
Continuous for all values of t

C)



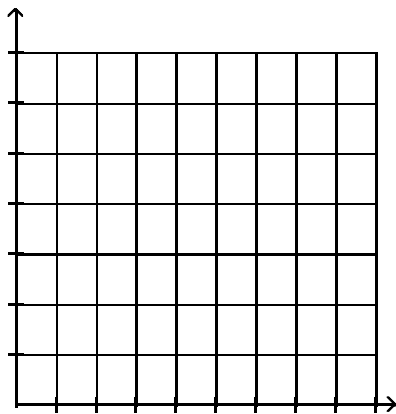
Continuous for $t \neq 1, 2, 3, 4, 5, 6, 7, 8, 9, 10$

D)

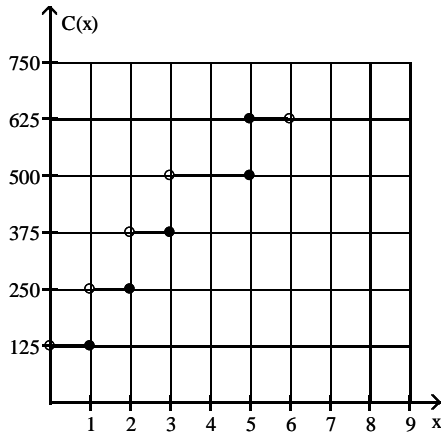


Continuous for all values of t

27) In order to boost business, a ski resort in Vermont is offering rooms for \$125 per night with every fourth night free. Let $C(x)$ represent the total cost of renting a room for x days. Sketch a graph of $C(x)$ on the interval $(0, 6]$ and determine the cost for staying $4\frac{1}{2}$ days. 27) _____

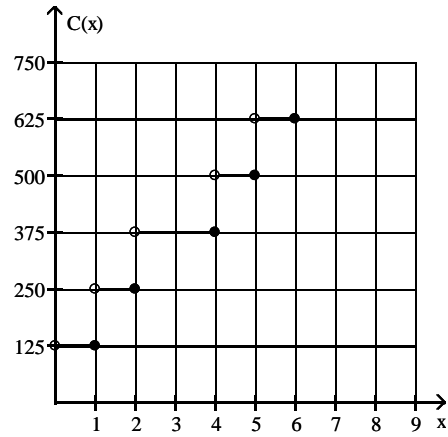


A)



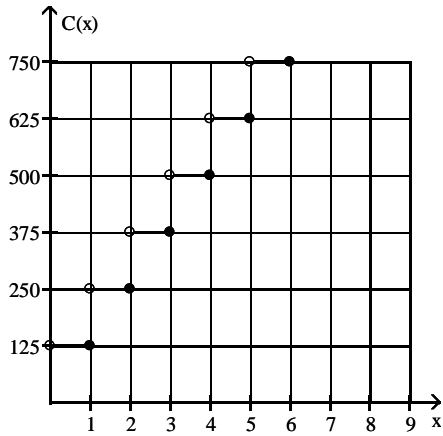
$$C\left(4\frac{1}{2}\right) = \$500$$

B)



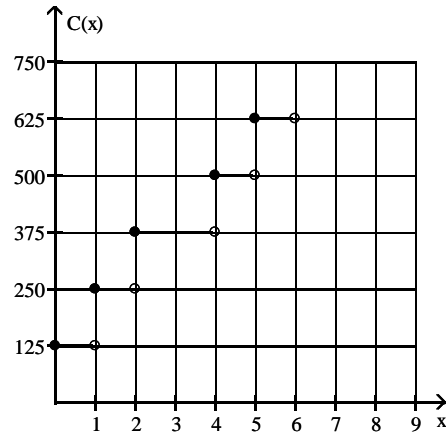
$$C\left(4\frac{1}{2}\right) = \$500$$

C)



$$C\left(4\frac{1}{2}\right) = \$625$$

D)



$$C\left(4\frac{1}{2}\right) = \$375$$

Find the average rate of change for the function over the given interval.

28) $y = x^2 + 5x$ between $x = 1$ and $x = 4$

A) 10

B) 12

C) 9

D) $\frac{15}{2}$

28) _____

29) $y = \sqrt{2x}$ between $x = 2$ and $x = 8$

A) $-\frac{3}{10}$

B) 2

C) 7

D) $\frac{1}{3}$

29) _____

30) $y = -3x^2 - x$ between $x = 5$ and $x = 6$

A) -2

B) $\frac{1}{2}$

C) -34

D) $-\frac{1}{6}$

30) _____

Give an appropriate answer.

31) Find the instantaneous rate of change for the function $x^2 + 8x$ at $x = 5$.

A) 13

B) 18

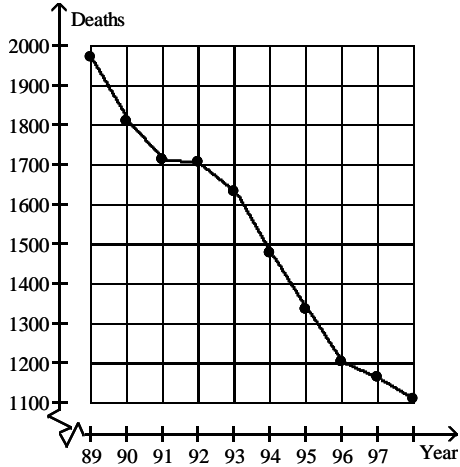
C) 65

D) 10

31) _____

Solve the problem.

32) The graph below shows the number of tuberculosis deaths in the United States from 1989 to 1998. 32) _____



Estimate the average rate of change in tuberculosis deaths from 1996 to 1998.

- A) About -20 deaths per year
- B) About -.5 deaths per year
- C) About -90 deaths per year
- D) About -50 deaths per year

33) Suppose that the total profit in hundreds of dollars from selling x items is given by 33) _____

$P(x) = -x^2 + 8x - 13$. Find the marginal profit at $x = 5$.

- A) \$200 per item
- B) -\$1000 per item
- C) \$0 per item
- D) -\$200 per item

Answer Key

Testname: LIMIT

- 1) A
- 2) A
- 3) A
- 4) A
- 5) D
- 6) B
- 7) D
- 8) C
- 9) C
- 10) C
- 11) B
- 12) C
- 13) C
- 14) A
- 15) C
- 16) D
- 17) D
- 18) A
- 19) B
- 20) B
- 21) D
- 22) A
- 23) B
- 24) B
- 25) A
- 26) C
- 27) B
- 28) A
- 29) D
- 30) C
- 31) B
- 32) D
- 33) D