

Name: Syed H Class: _____ Date: _____

Calculus Review #1

Indicate the answer choice that best completes the statement or answers the question.

1. Find the function $f \circ g$ and its domain if $f(x) = \frac{x-1}{x}$ and $g(x) = \frac{x}{x+5}$.

a. $\frac{x-1}{x+5}, D = (-\infty, -5) \cup (-5, 0) \cup (0, \infty)$

b. $\frac{x-1}{x+5}, D = (-\infty, -5) \cup (-5, \infty)$

c. $-\frac{5}{x}, D = (-\infty, -5) \cup (-5, 0) \cup (0, \infty)$

d. $-\frac{5}{x}, D = (-\infty, 0) \cup (0, \infty)$

$$f(g(x)) = \frac{\frac{x}{x+5} - 1}{\frac{x}{x+5}} = \frac{x - (x+5)}{x+5} = \frac{-5}{x+5}$$

$$\frac{x}{x+5} \quad \cancel{x+5} \quad \frac{-5}{x+5} = \frac{-5}{x}$$

$$D = (-\infty, 0), (0, -5), (-5, \infty)$$

$$X \neq 0, -5$$

2. The manager of a weekend flea market knows from past experience that if he charges x dollars for a rental space at the market, then the number y of spaces he can rent is given by the equation $y = 560 - 8x$. What does the x -intercept indicate?

a. There will be no spaces occupied when the rental cost is \$70.

b. There will be no spaces occupied when the rental cost is \$560.

c. There will be 560 spaces occupied when there is no rental cost.

d. There will be 8 spaces occupied when there is no rental cost.

e. The number of occupied spaces decreases by 5 for every \$1 increase in rent.

$$\frac{560}{8} = 70$$

A

3. The data below shows Usain Bolt's position during his gold medal winning 100-meter sprint at the 2008 summer Olympics. Find his average velocity between the 60 m and 90 m marks.

t (seconds)	1.85	2.87	3.78	4.65	5.50	6.32	7.14	7.96	8.79	9.69
s (meters)	10	20	30	40	50	60	70	80	90	100

a. 2.15 m/s

b. 0.08 m/s

c. 9.12 m/s

d. 8.9 m/s

e. 7.16 m/s

$$\frac{y_2 - y_1}{x_2 - x_1}$$

$$\frac{87.9 - 6.32}{90 - 60}$$

$$87.9 - 6.32$$

$$\frac{90 - 60}{87.9 - 6.32} = 12.1457$$

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4. It makes sense that the larger the area of a region, the larger the number of species that inhabit the region. Many ecologists have modeled the species-area relation with a power function. In particular, the number of species S of bats living in caves in central Mexico has been related to the surface area A of the caves by the equation $S = 0.7A^{0.3}$. If you discover that nine species of bats live in a cave, estimate the area of the cave.

- a. 4979 m^2
- b. 1.35 m^2
- c. 2125 m^2
- d. 2.15 m^2

$$\begin{aligned} A & \quad \cancel{S = 0.7A^{0.3}} \\ & \quad \cancel{\frac{9}{A^{0.3}} = 0.7} \\ & \quad \cancel{12.857 = A^3} \\ & \quad \cancel{\log_3 = \log A^3} \\ & \quad \cancel{A = 12.857 / \log_3 = -2.1212} \\ & \quad A^3 = 12.857 \\ & \quad A = (12.857)^{\frac{1}{3}} \\ & \quad A = 4979 \end{aligned}$$

5. If a rock is thrown upward on the planet Pluto with a velocity of 20 m/s, its height in meters t seconds later is given by $y = 20t - 0.32t^2$. Find the average velocity over the time interval $[3, 3.5]$. Round your answer to 1 decimal place if necessary.

- a. 17.9
- b. 9
- c. 4.5
- d. -9
- e. 37.9

$$\begin{aligned} y &= 20(3) - 0.32(3)^2 \\ t &= 3 \quad y = 57.12 \\ y &= 20(3.5) - 0.32(3.5)^2 \\ t &= 3.5 \quad y = 66.08 \end{aligned}$$

$$\begin{aligned} \frac{y_2 - y_1}{x_2 - x_1} &= \frac{66.08 - 57.12}{3.5 - 3} \\ &= 17.92 \end{aligned}$$

6. Classify the following function:

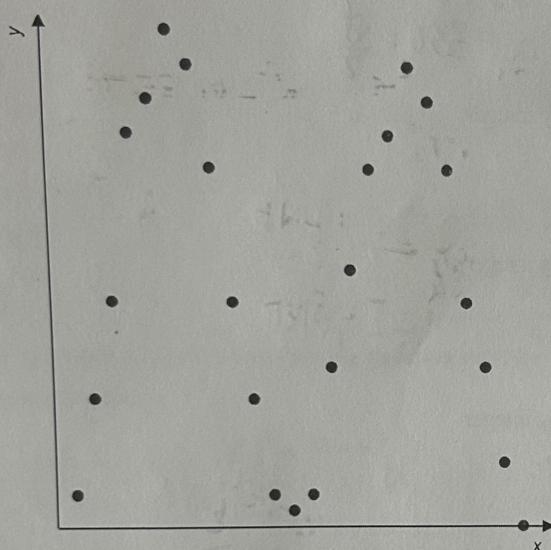
$$f(x) = x^6(9x^4 - 4)$$

- a. Polynomial function
- b. Power function
- c. Trigonometric function
- d. Rational Function
- e. Exponential function

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7. For the scatter plot below, what type of function might you see as a model for the data?

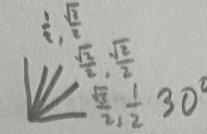


- a. Trigonometric function *???*
- b. Rational Function
- c. Exponential Function
- d. Power Function
- e. Polynomial Function

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8. Find the domain of the function

$$f(x) = \frac{1}{\sqrt{3} - 2\cos x}$$



$$\frac{\pi}{6} \cos 30 = \frac{\sqrt{3}}{2}$$

$$\frac{11\pi}{6} \cos = 330 = \frac{\sqrt{3}}{2}$$

a. $x \neq \frac{\pi}{6} + 2\pi n$ and $x \neq \frac{11\pi}{6} + 2\pi n$, where n is any integer

b. $x \neq \frac{11\pi}{6}$ and $x \neq \frac{11\pi}{6}$

c. $x \neq \frac{5\pi}{6} + 2\pi n$ and $x \neq \frac{7\pi}{6} + 2\pi n$, where n is any integer

d. $x \neq \frac{5\pi}{6}$ and $x \neq \frac{7\pi}{6}$

e. $x \neq \frac{\pi}{4} + 2\pi n$ and $x \neq \frac{7\pi}{4} + 2\pi n$, where n is any integer

9. Biologists have noticed that the chirping rate of crickets of a certain species is related to temperature, and the relationship appears to be very nearly linear. A cricket produces 108 chirps per minute at 70°F and 228 chirps per minute at 90°F. Find a linear equation that models the temperature T as a function of the number of chirps per minute N .

a. $T(N) = \frac{1}{6}N + \frac{312}{6}$

b. $T(N) = \frac{1}{6}N - \frac{312}{6}$

c. $T(N) = 6N - 648$

d. $N(T) = 6T - 312$

e. $N(T) = -6T + 312$

$$\frac{y_2 - y_1}{x_2 - x_1}$$

$$(x_1, y_1) = (108, 70)$$

$$(x_2, y_2) = (228, 90)$$

$$\frac{90 - 70}{228 - 108} \cdot \frac{20}{120} = \frac{1}{6}$$

$$y = \left(\frac{1}{6}x + b\right)$$

$$y = \frac{1}{6}x + 52$$

$$70 = \frac{1}{6}(108) + b$$

$$70 = 18 + b$$

$$y = mx + b$$

$$y = -15x + b$$

$$y = 16x + 52$$

$$52 = b$$

~~$$y = -15x + b$$~~

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10. At the surface of the ocean, the water pressure is the same as the air pressure above the water, 13 lb/in². Below the surface, the water pressure increases by 4.34 lb/in² for every 10 ft of descent. At approximately what depth is the pressure 120 lb/in²?

- a. 247 ft
- b. 276 ft
- c. 30 ft
- d. 56 ft
- e. 359 ft

A

$$y = 4.34\left(\frac{x}{10}\right) + 13$$

$$120 = 4.34\left(\frac{x}{10}\right) + 13$$

$$\frac{107}{4.34} = \frac{4.34\left(\frac{x}{10}\right)}{4.34}$$

$$24.6544 = \frac{x}{10} \quad x = 246.544$$

$$x \approx 247$$

Enter the appropriate value to answer the question or solve the problem.

11. Evaluate the limit.

$$\lim_{x \rightarrow \infty} \frac{8x^2 - 9x + 1}{9x^2 + 9x - 3}$$

$$\frac{\frac{8x^2}{x^2} - \frac{9x}{x^2} + \frac{1}{x^2}}{\frac{9x^2}{x^2} + \frac{9x}{x^2} - \frac{3}{x^2}}$$

$$\frac{8 - \frac{9}{x} + \frac{1}{x^2}}{9 + \frac{9}{x} - \frac{3}{x^2}}$$

$$= \frac{8}{9}$$

12. A spherical balloon with radius r inches has volume $\frac{4}{3}\pi r^3$.

Find a function that represents the amount of air required to inflate the balloon from a radius of r inches to a radius of $r + 7$ inches.

$$V(r+7) - V(r)$$

$$\frac{4}{3}\pi(r+7)^3 - \frac{4}{3}\pi(r)^3$$

13. Find a function g that agrees with f for $x \neq 49$ and is continuous on \mathbb{R} .

$$f(x) = \frac{(7 - \sqrt{x})^2}{49 - x}$$

$$\frac{7 - \sqrt{x}}{(7 - \sqrt{x})(7 + \sqrt{x})}$$

$$\frac{1}{7 + \sqrt{x}}$$

$$g(x) = \frac{1}{7 + \sqrt{x}}$$

$$\lim_{x \rightarrow 49} f(x) \quad x = 49$$

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14. Consider the following function.

$$f(x) = \begin{cases} 2-x & x < -1 \\ x & -1 \leq x < 2 \\ (x-2)^2 & x \geq 2 \end{cases}$$



$$\lim_{x \rightarrow a} f(x)$$

Determine the values of a for which $\lim_{x \rightarrow a} f(x)$ exists.

$$x = \mathbb{R}, x \neq -1, 2$$

$$x \rightarrow -1^- = 3$$

$$x \rightarrow -1^+ = -1$$

$$x \rightarrow -1 = \text{DNE}$$

$$x \rightarrow 2^- = 2$$

$$x \rightarrow 2^+ = 0$$

$$x \rightarrow 2 = \text{DNE}$$

15. Evaluate the limit.

~~$$\lim_{x \rightarrow 16} \frac{4-\sqrt{x}}{x-16} \cdot \frac{4+\sqrt{x}}{4+\sqrt{x}} \lim_{x \rightarrow 16} (4-\sqrt{x})$$

$$(16-x)$$

$$(4+\sqrt{x})(x-16)$$

$$\lim_{x \rightarrow 16} (x-16)$$

$$\frac{1}{\sqrt{x+4}} = \frac{1}{4+\sqrt{16}} = \frac{1}{8}$$

$$-(x-16)$$

$$(x-16)(4+\sqrt{x})$$

$$\frac{-1}{4+\sqrt{x}}$$~~

16. Evaluate the limit.

$$\lim_{x \rightarrow 3} \left(\frac{x^3-3}{x^2-4} \right)$$

$$\frac{3^3-3}{3^2-4} = \frac{27-3}{9-4} = \frac{24}{5} = 4.8$$

~~$$\lim_{x \rightarrow 16} \frac{4}{x-16} - \frac{\lim_{x \rightarrow 16} \sqrt{x}}{x-16}$$

$$\lim_{x \rightarrow 16} x - \lim_{x \rightarrow 16} 16$$

$$\frac{4}{16-16} - \frac{4-\sqrt{16}}{4+\sqrt{16}} = \text{DNE}$$

$$0 - \frac{1}{4+\sqrt{16}} = \frac{1}{8}$$~~

17. Write an equation that expresses the fact that a function f is continuous at the number 9.

$$\lim_{x \rightarrow 9} f(x) = f(9)$$

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18. Determine whether f is even, odd, or neither.

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

even

$$\frac{2(2)^2}{2^4 + 1} \quad \frac{8}{17} \quad \frac{2(-2)^2}{(-2)^4 + 1} \quad \frac{8}{17}$$

19. Find the domain of the function.

$$f(x) = \sqrt{25 - x^2}$$

~~$x > 5$~~

~~$x < -5$~~

$$-5 < x < 5$$

20. Find the domain of the function.

$$f(x) = \frac{7}{3x - 1}$$

$$x \neq \frac{1}{3}$$

$$3x - 1 = 0$$

$$3x = 1$$

$$\frac{1}{3}$$

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21. The relationship between the Fahrenheit and Celsius temperature scales is given by the linear function.

$$F = \frac{9}{5}C + 32$$

Complete the table and find the slope. Round your answers to the nearest whole number.

°C	°F
15	59
-15	5
slope	9/5 or 2

$$\frac{9}{5}(15) + 32 = 59$$

$$\frac{9}{5}(-15) + 32 = 5$$

$$\frac{9}{5} \approx 2$$

Indicate the answer choice that best completes the statement or answers the question.

22. Find the limit.

$$\lim_{x \rightarrow \infty} \frac{\sqrt{x^2 - 9}}{5x - 15} \quad \frac{x-3}{5x-15} \cdot \frac{1}{x-3}$$

- a. -3
- b. 3
- c. 15
- d. $\frac{1}{5}$
- e. does not exist

d

23. Suppose the distance s (in feet) covered by a car moving along a straight road after t sec is given by the function $s = f(t) = 2t^2 + 20t$. Calculate the (instantaneous) velocity of the car when $t = 34$.

- a. 56 ft/sec
- b. 22 ft/sec
- c. 748 ft/sec
- d. 2992 ft/sec

$$\begin{aligned} & \cancel{2(34)^2 + 20(34)} \\ & \cancel{2992} \\ & 2(33.99)^2 + 20(33.99) \\ & \frac{y_2 - y_1}{x_2 - x_1} = 2990.4402 \\ & 156 = \frac{2993.5602 - 2990.4402}{34.01 - 33.99} = 993.5602 \end{aligned}$$

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24. A rectangle has perimeter 14 m. Express the area of the rectangle as a function $A(l)$ of the length l of one of its sides.

a. $A(l) = 7l - l^2$

b. $A(l) = l - 7l^2$

c. $A(l) = 14l - l^2$

d. $A(l) = 14l + l^2$

e. $A(l) = 7l + l^2$

A

$A(l) =$

$P = 2l + 2w$

$\underline{14 = 2l + 2w}$

$A = l \cdot w$

$7 = l + w$

~~$A = l \cdot (7 - l)$~~

$w = 7 - l$

$A = l \cdot (7 - l)$

$l = 7 - w$

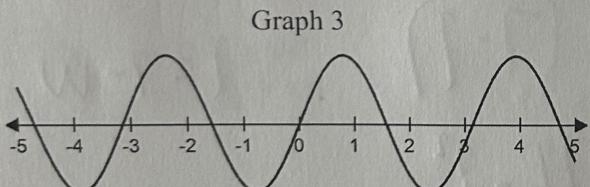
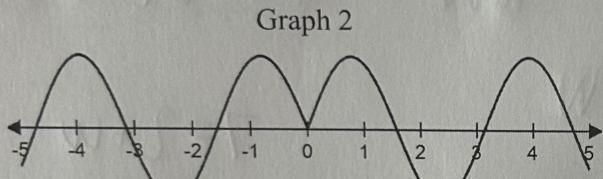
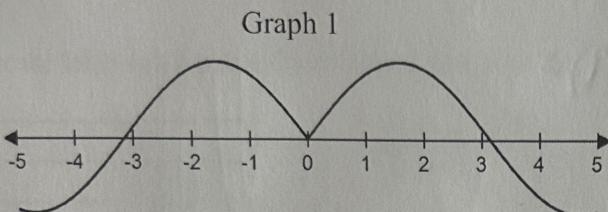
$A = 7l - l^2$

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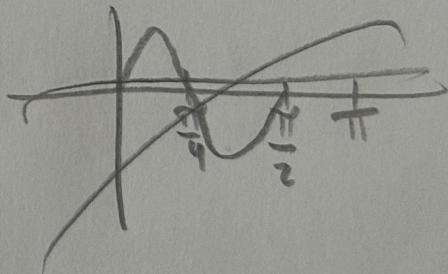
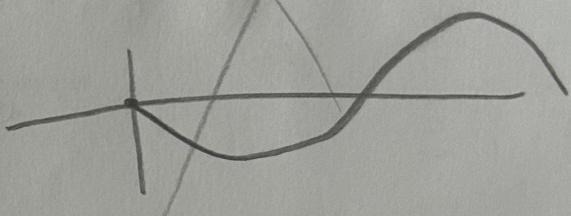
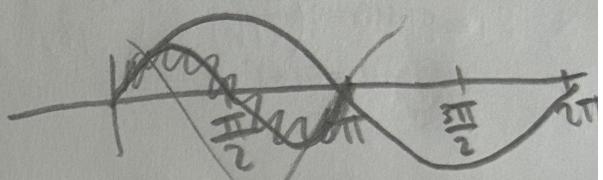
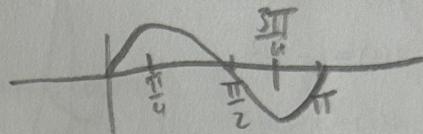
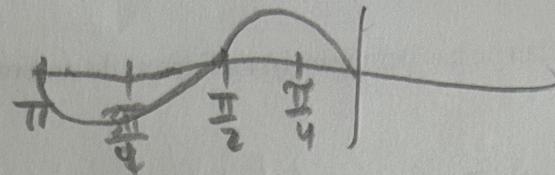
25. Which of the following graphs is the graph of the function?

$$f(x) = \sin|2x|$$



- a. Graph 2
b. Graph 1
c. Graph 3

B A



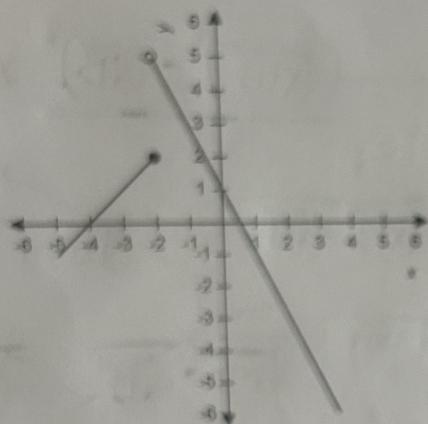
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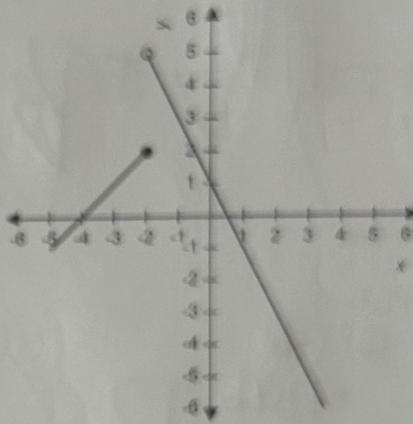
26. Sketch the graph of the function f and evaluate $\lim_{x \rightarrow -2^-} f(x)$

$$f(x) = \begin{cases} x+4, & \text{if } x \leq -2 \\ -2x+1, & \text{if } x > -2 \end{cases}$$

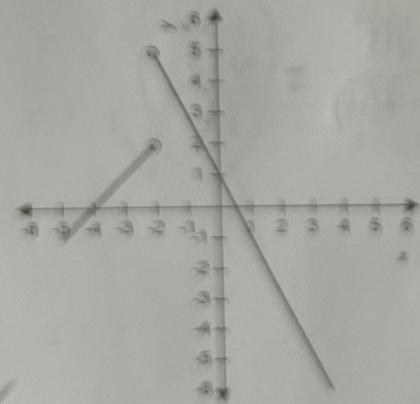
a.



b.

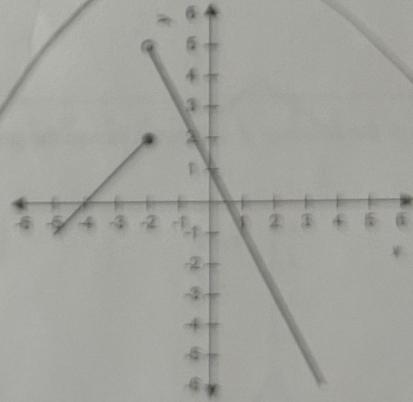


Does not exist



c.
Does not exist

5



4. 2

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27. Find the limit $\lim_{x \rightarrow 0} \frac{\sqrt{x+13} - \sqrt{13}}{x}$, if it exists.

a. Does not exist

b. $\frac{\sqrt{13}}{26}$

c. $\frac{\sqrt{13}}{2}$

d. $\frac{\sqrt{13}}{13}$

28. Evaluate the limit.

$$\lim_{x \rightarrow 1} (x+5)^3(x^2-7)$$

(6)³ (-6)

a. -448

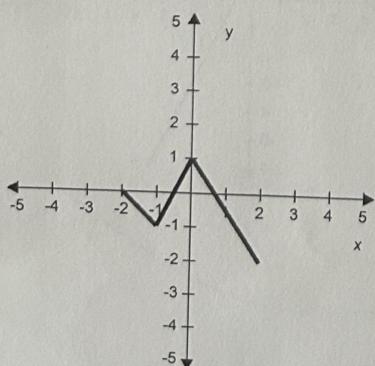
b. -1286

c. -1306

d. -1296

e. 320

29. The graph of the function f follows. Choose the graph of $y = -f(x) - 1$.



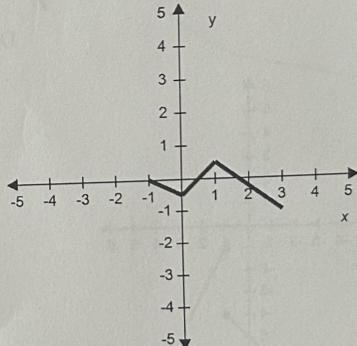
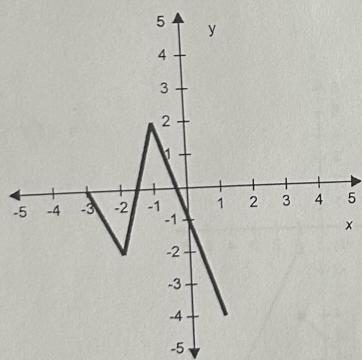
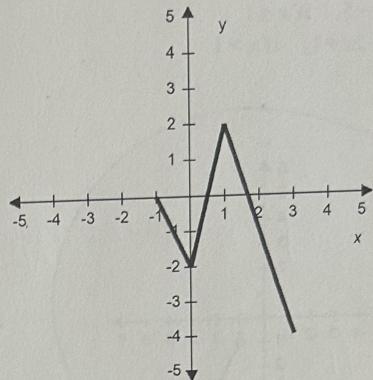
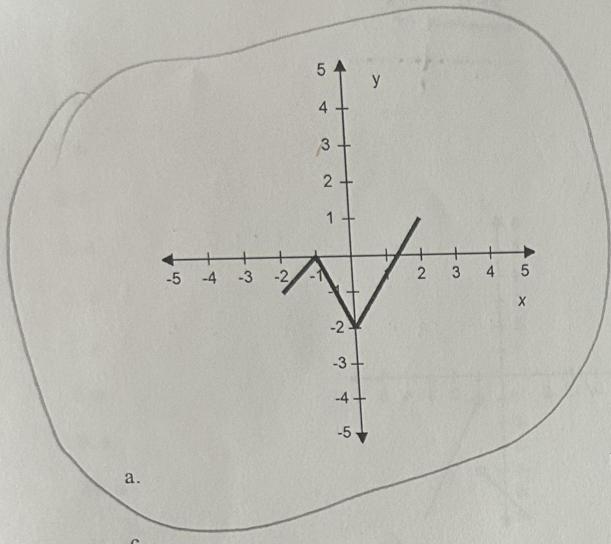
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flipped on x axis and lowered by 1

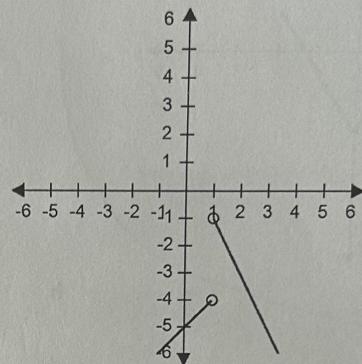
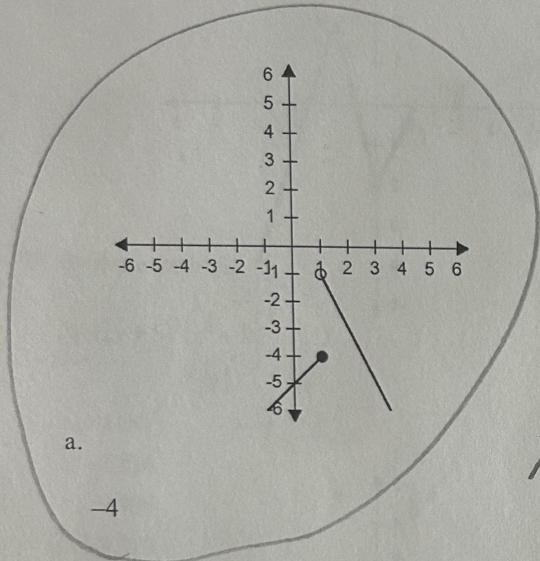
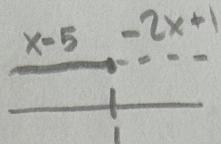


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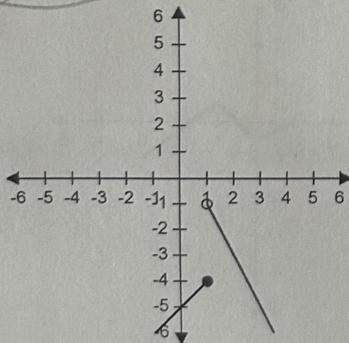
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30. Sketch the graph of the function f and evaluate $\lim_{x \rightarrow 1^-} f(x)$.

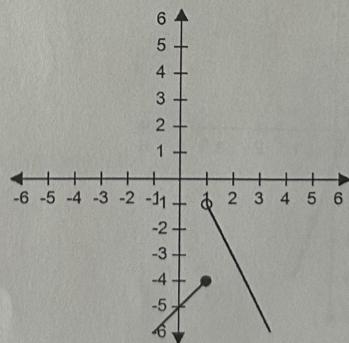
$$f(x) = \begin{cases} x-5, & \text{if } x \leq 1 \\ -2x+1, & \text{if } x > 1 \end{cases}$$



Does not exist



Does not exist



-1

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Answer Key

1. c

2. a

3. a

4. a

5. a

6. a

7. a

8. a

9. a

10. a

11. $\frac{8}{9}$

12. $\frac{28}{3} \pi (3r^2 + 21r + 49)$

13. $g(x) = \frac{1}{7 + \sqrt{x}}$

14. $(-\infty, -1) \cup (-1, 2) \cup (2, \infty)$

15. $-1/8$

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16. $\frac{24}{5}$

17. $\lim_{x \rightarrow 9} f(x) = f(9)$

18. even

19. $[-5, 5]$

20. $\left\{x \mid x \neq \frac{1}{3}\right\}$

21. $(15, 59), (-15, 5)$; slope = 2

22. d

23. a

24. a

25. a

26. d

27. b

28. d

29. a

30. a