

CREDIT WILL BE AWARDED BASED ON WORK SHOWN. THERE WILL BE NO CREDIT FOR GUESSING. PLEASE PRESENT YOUR WORK IN AN ORGANISED, EASY TO READ FASHION.

1. (5 POINTS) Let $g(x) = -x^2 + 4$.

a. (2 POINTS) Find the average rate of change from -3 to 6.

$$\begin{aligned} \text{average rate of change} &= \frac{g(6) - g(-3)}{6 - (-3)} \\ &= \frac{-32 - (-5)}{6 + 3} \\ &= \frac{-27}{9} \rightarrow = -3 \end{aligned}$$

$$\begin{aligned} g(6) &= -6^2 + 4 = -36 + 4 = -32 \\ g(-3) &= -(-3)^2 + 4 = -9 + 4 = -5 \end{aligned}$$

b. (3 POINTS) Find an equation of the secant line containing $(-3, g(-3))$ and $(6, g(6))$. Give your result in the point-slope form of the line.

$$m_{\text{sec}} = -\frac{27}{9}$$

$(-3, -5)$ is a point on the line
 $(6, -32)$ " " " " " "

$$\begin{aligned} y - y_1 &= m(x - x_1) \\ y - (-5) &= -3(x - (-3)) \\ y + 5 &= -3(x + 3) \end{aligned}$$

OR...

$$\begin{aligned} y - (-32) &= 3(x - 6) \\ y + 32 &= 3(x - 6) \end{aligned}$$

2. (3 POINTS) Use a graphing calculator to approximate the real solutions, if any, of the given equation rounded to two decimal places. All solutions lie between -10 and 10.

$$-3x^4 + 5 = \frac{x}{2} - 1$$

$$x = \left\{ -1.22, 1.16 \right\}$$

3. (8 POINTS) The function below is defined by two equations. The equation in the first row gives the output for negative numbers in the domain. The equation in the second row gives the output for nonnegative numbers in the domain. Find the indicated function values.

$$f(x) = \begin{cases} -x^3 & \text{if } x < -2 \\ -x - 5 & \text{if } -2 \leq x < 4 \\ x^2 - 2 & \text{if } x \geq 4 \end{cases}$$

$$\begin{aligned} f(-2) &= -(-2)^3 - 5 = 2 - 5 = -3 \\ f(0) &= -(0) - 5 = -5 \\ f(6) &= (6)^2 - 2 = 36 - 2 = 34 \end{aligned}$$

a. $f(-2) = \underline{-3}$

c. $f(6) = \underline{34}$

b. $f(0) = \underline{-5}$

d. $f(-2) + f(6) = \underline{31}$
 $-3 + 34$

4. (6 POINTS) Find the difference quotient of f ; that is, find $\frac{f(x+h)-f(x)}{h}$, $h \neq 0$, for the following function.

$$f(x) = -x^2 + 2$$

$$\begin{aligned} \frac{f(x+h)-f(x)}{h} &= \frac{[-(x+h)^2 + 2] - [-x^2 + 2]}{h} \\ &= \frac{-(x^2 + 2xh + h^2) + 2 + x^2 - 2}{h} \\ &= \frac{-x^2 - 2xh - h^2 + x^2}{h} \\ &= \frac{-2xh - h^2}{h} \\ &= -2x - h \end{aligned}$$

5. (6 POINTS) If a rock falls from a height of 48 meters on Earth, the height H in meters after x seconds is approximately $H(x) = 48 - 4.9x^2$. Round your answers to three decimal places. Give the appropriate units with your answers.

a. What is the height of the rock when $x = 1.2$ seconds? _____

$$40.944 \text{ m}$$

b. When is the height of the rock 6 meters? _____

$$2.928 \text{ seconds}$$

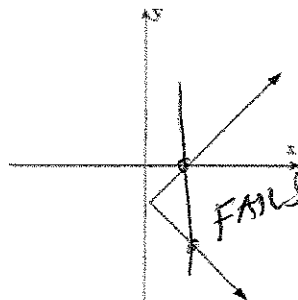
c. When does the rock hit the ground? _____

$$3.130 \text{ seconds}$$

Consider the compound inequality

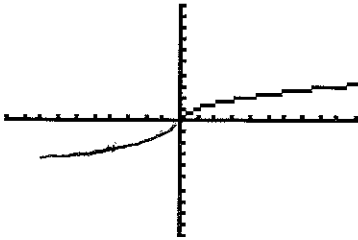
6. (2 POINTS) Use the vertical line test to determine if y is a function of x in the given graph. Is y a function of x ? Circle one response:

Yes No

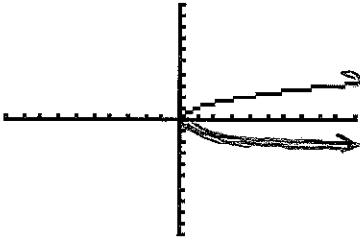


7. (6 POINTS) Complete the graph so that the graph is symmetric with respect to the:

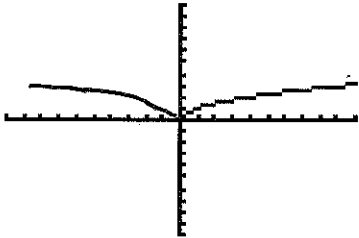
a. Origin



b. x-axis



c. y-axis

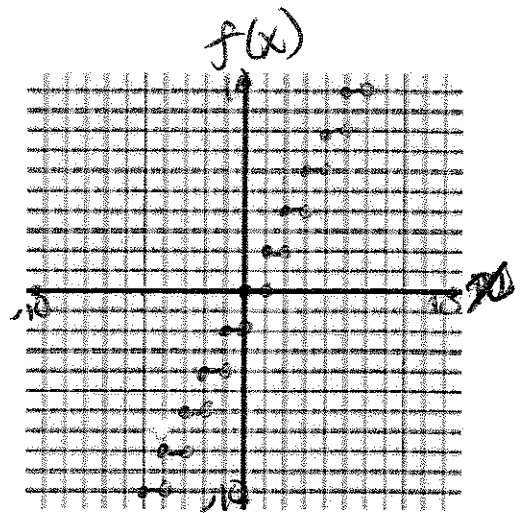


8. (7 POINTS) The function f is defined as follows: $f(x) = 2 \text{int}(x)$.

a. (3 POINTS) Graph the function. Be sure to label axes and scale.

b. (2 POINTS) What is the domain? $(-\infty, \infty)$

c. (2 POINTS) Is f continuous on its domain? NO



9. (4 POINTS) Give the domain of $f(x) = \frac{2x}{4x^2 - 25}$ in interval notation.

$$4x^2 - 25 \neq 0$$

$$(2x+5)(2x-5) \neq 0$$

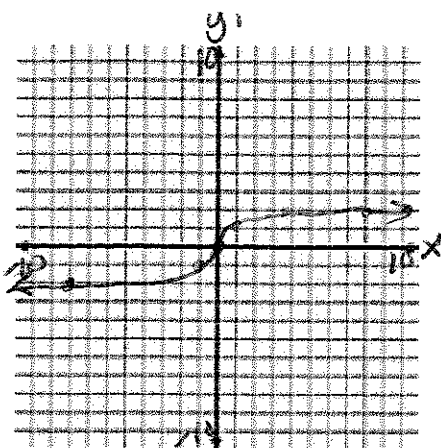
$$2x+5 \neq 0 \text{ or } 2x-5 \neq 0$$

$$2x \neq -5 \quad 2x \neq 5$$

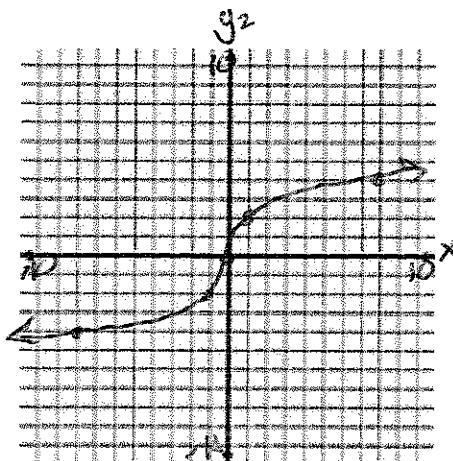
$$x \neq -\frac{5}{2} \quad x \neq \frac{5}{2}$$

$$\left(-\infty, -\frac{5}{2} \right) \cup \left(-\frac{5}{2}, \frac{5}{2} \right) \cup \left(\frac{5}{2}, \infty \right)$$

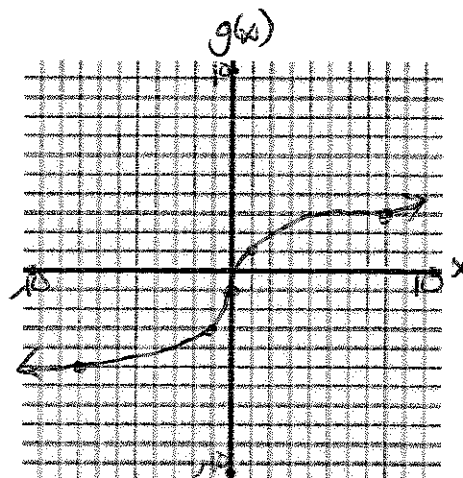
10. (9 POINTS) Graph $g(x) = 2\sqrt[3]{x} - 1$ by hand using transformations. Fill in the blanks below to indicate the first two graphs.



$$y_1 = \sqrt[3]{x}$$



$$y_2 = 2\sqrt[3]{x}$$



$$g(x) = 2\sqrt[3]{x} - 1$$

11. (8 POINTS) A rectangle is inscribed in a circle of radius 4. Let $P = (x, y)$ be the point in quadrant I that is a vertex of the rectangle and is on the circle.

- a. (3 POINTS) Express the area A of the rectangle as a function of x .

$$A(x, y) = 2xy$$

$$A(x, y) = 4xy$$

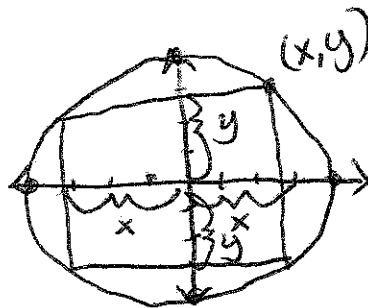
$$A(x) = 4x\sqrt{16-x^2}$$

$$x^2 + y^2 = 4^2$$

$$y^2 = 16 - x^2$$

$$y = \pm \sqrt{16 - x^2}$$

$$\text{QI: } y = \sqrt{16 - x^2}$$



- b. (3 POINTS) Express the perimeter p of the rectangle as a function of x .

$$P(x, y) = 2(2x) + 2(2y)$$

$$P(x, y) = 4x + 4y$$

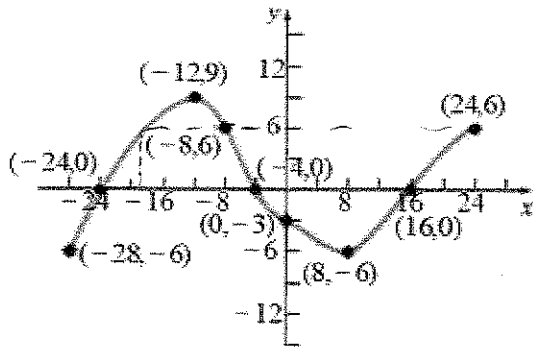
$$P(x) = 4x + 4\sqrt{16 - x^2}$$

$$P(x) = 4(x + \sqrt{16 - x^2})$$

- c. (1 POINT) Graph $A = A(x)$. For what value of x is A largest? $x = 2.8$

- d. (1 POINT) Graph $p = p(x)$. For what value of x is p largest? $x = 2.8$

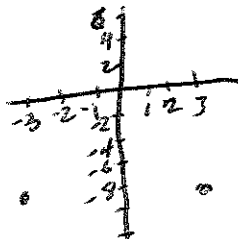
12. (14 POINTS) Consider the graph of $f(x)$ below.



- a. For what value(s) of x is $f(x)$ equal to -6 ? $x = -28$ and $x = 8$
- b. $f(8) = -6$
- c. On what interval(s) is f increasing? $(-28, -12) \cup (8, 24)$
- d. On what interval(s) is f decreasing? $(-12, 8)$
- e. What is the domain of f ? $[-28, 24]$
- f. What is the range of f ? $[-6, 9]$
- g. For what values of x is $f(x) > 6$? $(-12, -8)$

13. (2 POINTS) Given that the point $(3, -8)$ is on the graph of an equation that is symmetric with respect to the y -axis, what other point is on the graph?

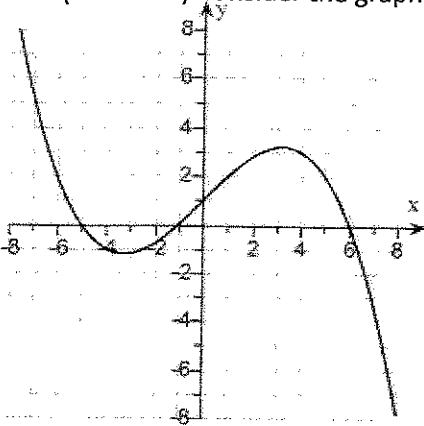
$(-3, -8)$



14. (2 POINTS) If $(-7, 2)$ is a point on the graph of $y = f(x)$, what point of the following must be on the graph of $f(x-1)$?

$(-6, 2)$

15. (8 POINTS) Consider the graph below.



a. (3 POINTS) List the x-intercept(s), if any, as ordered pairs:

$(-5, 0), (6, 0), (-1, 0)$

b. (1 POINT) List the y-intercept, if any, as an ordered pair:

$(0, 1)$

c. (2 POINTS) Give the domain in interval notation:

$(-\infty, \infty)$

d. (2 POINTS) Give the range in interval notation:

$(-\infty, \infty)$

16. (4 POINTS) Find the equation of the line that is parallel to the line $y = -5x + 1$ and passes through the point $(-1, 6)$.

$y - y_1 = m(x - x_1)$

$y - 6 = -5(x - (-1))$

$y - 6 = -5(x + 1)$ point-slope form

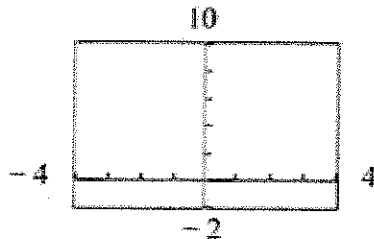
$m = -5$

$y - 6 = -5(x + 1)$

$y - 6 = -5x - 5$

$y = -5x + 1$ slope-intercept form

17. (6 POINTS) Determine the viewing window used.



- a. Xmin = -4
- b. Xmax = 4
- c. Xscl = 1

- d. Ymin = -2
- e. Ymax = 10
- f. Yscl = 2