

1) (2 points each) For the given points $(7, -6)$ and $(3, -3)$, find...

a) The distance between them:

$$d = \sqrt{(3-7)^2 + (-3-(-6))^2}$$
$$= \sqrt{16+9} = \textcircled{5}$$

b) Their midpoint:

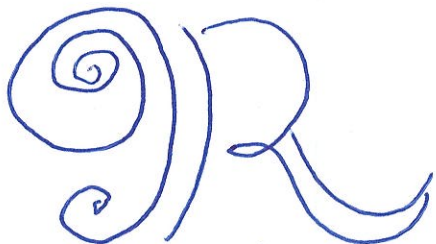
$$\left(\frac{7+3}{2}, \frac{-6+(-3)}{2}\right) = \left(5, -\frac{9}{2}\right)$$

c) Find the equation of the circle where $(7, -6)$ and $(3, -3)$ are endpoints of a diameter of the circle:

$$(x-5)^2 + \left(y + \frac{9}{2}\right)^2 = \left(\frac{5}{2}\right)^2 = \frac{25}{4}$$

2) (3 points each) Find the domain of the following functions:

a) $f(x) = 3x^2 + 6x^2 - 3x - 6$



fancy!

b) $g(x) = \frac{5x^2 + 8x + 4}{x^2 + 5x + 6}$

$$x^2 + 5x + 6 = 0$$
$$(x+2)(x+3) = 0$$
$$x \neq -2, -3$$

c) $h(x) = \frac{4x+1}{\sqrt{5x+7}}$

$$5x+7 > 0$$
$$x > -7/5$$
$$(-7/5, \infty)$$

3) (4 points) In the morning, you checked the temperature and it was 54 degrees. Five hours later, you checked again and it was 76 degrees. Use this information to determine how much the temperature increased every hour during those 5 hours. Assume the change was linear. Be sure to show supporting work.

$$\frac{76-54}{5} = \frac{22}{5} = 4.4^\circ \text{ per hour}$$

4) (4 points) The number of copies, G in thousands, sold of the game *Stardew Valley Crossing* can be modeled by the function $G(x) = -2.4x^2 + 86x + 190$ where x is the number of days after the games released. Find and interpret the average rate of change from the 5th to the 10th day after the game was released.

$$\frac{G(10) - G(5)}{10 - 5} = \frac{810 - 560}{5} = 50$$

The number of copies sold was increasing by 50,000 copies per day from the 5th to the 10th day.

5) (2 points each) Cristiano, owner of the coffee house Il Picchio in Rome, started to track the number of customers he received after he started a new sales campaign on June 1st. The number of customers per date is shown in the table below.

Date	June 1	June 2	June 3	June 4	June 5	June 6	June 7
Number of Customers	538	563	580	602	640	656	698

Let x be the number of days since June 1st and let y be the number of customers.

a) Using the LinReg function on your calculator, find the equation of the regression line. Round values to two decimal places:

$$y = 25.93x + 533.21$$

b) Interpret the slope and y -intercept using the language of the problem. In your interpretation, you can round values to the nearest whole number and use the word "about":

words

c) Assuming this trend continues, the number of expected customers on June 12th:

$$x = 11$$

$$y = 25.93(11) + 533.21 = 818.44$$

about 818 customers

6) (2 points each) For the given graph, find the following. Write parts $a - d$ in interval notation. For parts c and d , write in terms of x . For parts e and f , write answer as an ordered pair.

a) The Domain

\mathbb{R}

b) The Range

\mathbb{R}

c) Increases

$(-\infty, -2) \cup (6, \infty)$

d) Decreases

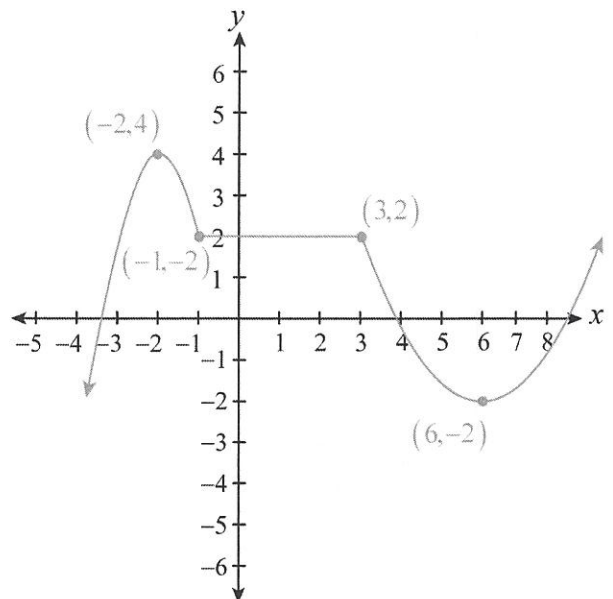
$(-2, -1) \cup (3, 6)$

e) Relative Maximum(s)

$(-2, 4)$

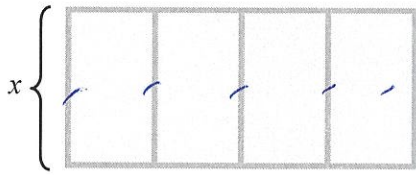
f) Relative Minimum(s)

$(4, -2)$



183

- 7) (5 points) Inspired by the game *Stardew Valley Crossing*, Mike decides to take up farming. He plans to build 4 adjacent, rectangular pens enclosed on all sides. He has 400 feet of fencing available. He needs to determine a function that will relate the area of the enclosure to the width x ; however, he just started playing the video game and he wants you to find this function.



$$5x + 2y = 400 \Rightarrow y = 200 - \frac{5}{2}x$$

$$A = xy = x(200 - \frac{5}{2}x)$$

$$A(x) = -\frac{5}{2}x^2 + 200x$$

- 8) (2 points each) For the functions $f(x) = x^2 + 3x$ and $g(x) = \sqrt{4x+1}$, find and simplify...

a) $(f+g)(x)$

$$= x^2 + 3x + \sqrt{4x+1}$$

b) $(f \circ g)(x)$

$$= (\sqrt{4x+1})^2 + 3(\sqrt{4x+1})$$

$$= 4x+1 + 3\sqrt{4x+1}$$

c) The domain of $f \circ g$

$$Dg: x \geq -\frac{1}{4}$$

$$Df: \mathbb{R}$$

$$D_{f \circ g}: x \geq -\frac{1}{4}$$

- 9) (3 points) Find two functions f and g such that $H = f \circ g$ where $H(x) = 6\sqrt{8x^2+3}+1$:

multiple answers! $f(x) = 6\sqrt{x} + 1$

$$g(x) = 8x^2 + 3$$

- 10) (6 points) For the function $f(x) = 3x^2 + 8x + 1$, find and simplify $\frac{f(x+h) - f(x)}{h}$:

$$\frac{3(x+h)^2 + 8(x+h) + 1 - (3x^2 + 8x + 1)}{h} = \frac{3x^2 + 6xh + 3h^2 + 8x + 8h + 1 - 3x^2 - 8x - 1}{h}$$

$$= \frac{6xh + 3h^2 + 8h}{h} = \frac{h(6x + 3h + 8)}{h} = \boxed{6x + 3h + 8}$$

- 11) (4 points) Determine if the function $f(x) = \frac{5x^2+8}{|x|}$ is even, odd, or neither algebraically:

$$f(-x) = \frac{5(-x)^2 + 8}{|-x|} = \frac{5x^2 + 8}{|x|} \text{ Even!}$$

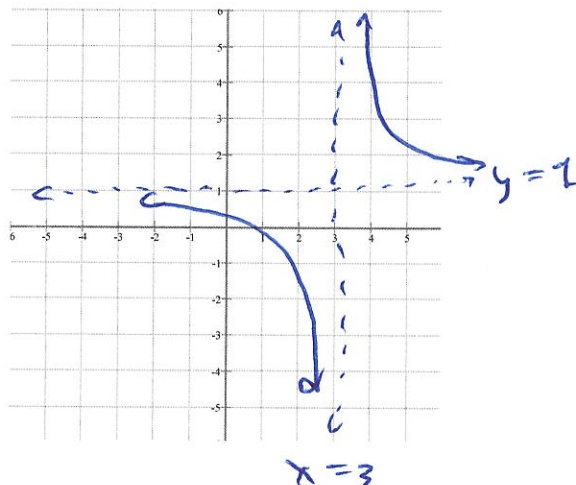
24

12) (3 points each) For the function $f(x) = \frac{1}{x-3} + 1 \dots$

a) List the steps needed to sketch a graph:

b) Sketch a graph. Be sure to label the asymptotes.

1. Right 3
2. Up 1



13) (2 points each) Given the point $(5, 10)$ on the graph of $y = f(x)$, find the **exact value** of the coordinates of the point under the transformation below:

a) $y = f(x) + 6$

b) $y = f(x - 4)$

c) $y = -f(x) - 2$

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

$(5, 16)$

$(9, 10)$

$(5, -12)$

$(6, 6)$

14) (1 point each) Match the following functions the best picture:

G H Constant

E Linear

F G Identity

F Cube

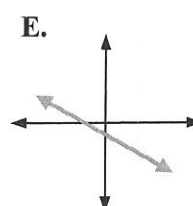
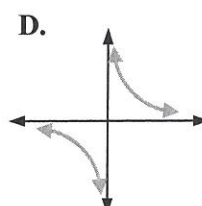
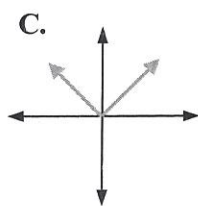
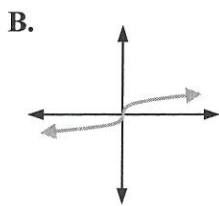
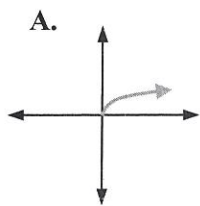
H I Square

A Square root

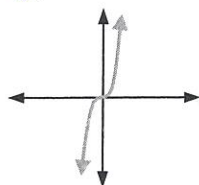
B Cube root

D Reciprocal

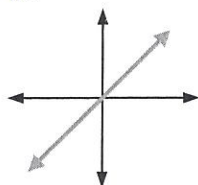
C Absolute value



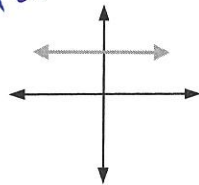
F D



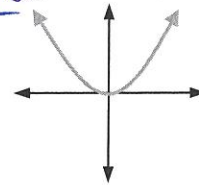
G F



H A



I A



23
5