

- 1) (4 points) Find the equation of a circle in standard form where the points $(-2,1)$ and $(10,6)$ are endpoints of a diameter of the circle:

$$r = \frac{\sqrt{(10 - (-2))^2 + (6 - 1)^2}}{2} = \frac{13}{2} \quad \text{Center } \left(-\frac{2+10}{2}, \frac{1+6}{2}\right) = \left(4, \frac{7}{2}\right)$$

$$(x-4)^2 + \left(y - \frac{7}{2}\right)^2 = \left(\frac{13}{2}\right)^2 = \frac{169}{4}$$

- 2) (4 points each) Find the domain of the following functions:

a) $f(x) = 3x^3 + 8x - 10$

\mathbb{R}

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

$$x^2 + 6x + 5 = 0$$

$$(x+5)(x+1) = 0$$

$$x \neq -5, -1$$

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

$$5x - 7 > 0$$

$$x > 7/5$$

- 3) (5 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 was increasing by 50,000 copies per day from Day 5 to 10.

- 4) (3 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!

slope: y per x

y -int: $x=0$ implies ...

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

$$x=11$$

$$y = 25.93(11) + 533.21 = 819.44$$

About 819

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5) (2 points each) For the given graph, find the following. Write parts a – d in interval notation. For parts e and f, write in terms of x. For parts e and f, write answer as an ordered pair.

a) The Domain

$$\mathbb{R}$$

b) The Range

$$[0, \infty)$$

c) Increases

$$(1, 3) \cup (5, \infty)$$

d) Decreases

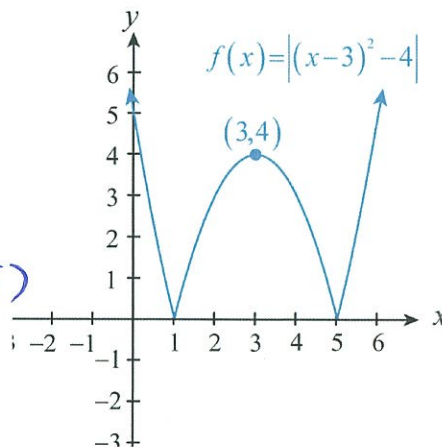
$$(-\infty, 1) \cup (3, 5)$$

e) Relative Maximum(s)

$$(3, 4)$$

f) Relative Minimum(s)

$$(1, 0) \text{ \& } (5, 0)$$



6) (4 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. Determine a function that will relate the area of the enclosure to the width.



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

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

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

7) (6 points) For the function $f(x) = 2x^2 + 5x + 1$, find and simplify $\frac{f(x+h) - f(x)}{h}$.

$$\frac{2(x+h)^2 + 5(x+h) + 1 - (2x^2 + 5x + 1)}{h} = \frac{2x^2 + 4xh + 2h^2 + 5x + 5h + 1 - 2x^2 - 5x - 1}{h}$$

$$= \frac{4xh + 2h^2 + 5h}{h} = \frac{h(4x + 2h + 5)}{h} = 4x + 2h + 5$$

8) (3 points each) For the functions $f(x) = x^2 + 2x$ and $g(x) = \sqrt{5x - 1}$, find and simplify...

a) $(f - g)(x)$

$$x^2 + 2x - \sqrt{5x - 1}$$

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

$$= (\sqrt{5x-1})^2 + 2(\sqrt{5x-1})$$

$$= 5x - 1 + 2\sqrt{5x-1}$$

c) The domain of $f \circ g$

$$D_g: x \geq 1/5$$

$$D_f: \mathbb{R}$$

$$D_{f \circ g}: x \geq 1/5$$

9) (3 points) Find two non-identity functions f and g such that $H = f \circ g$ where $H(x) = \frac{2}{4x-1} + 5$.

multiple answers.

$$f(x) = \frac{2}{x} + 5$$

$$g(x) = 4x - 1$$

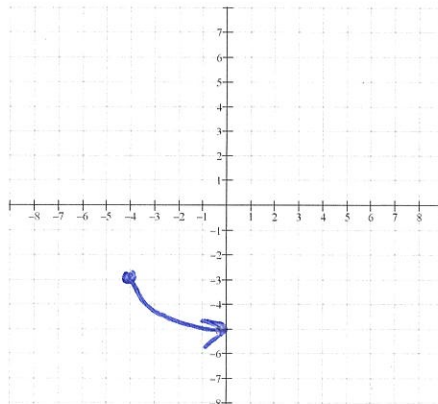
10) (3 points) Determine if the function $f(x) = \frac{5x^2 + 8}{|x|}$ is even, odd, or neither algebraically.

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

11) (4 points each) For the function $f(x) = -\sqrt{x+4} - 3$...

- a) Explain, in order, the transformations needed to sketch the graph: b) Sketch the graph without a calculator:

- 1) Left 4
- 2) vertically reflect
- 3) Down 3



12) (2 points each) Given the point (4,5) 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) $y = 2f(x - 1) - 1$

(4, 11) (8, 5) (4, -3) (5, 9)

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13) (1 point each) Match the following functions the best picture:

F Cube root

U Linear

D Identity

E Square

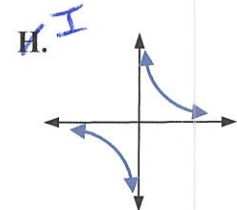
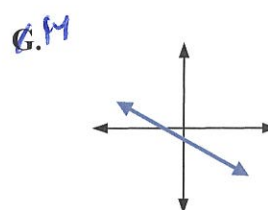
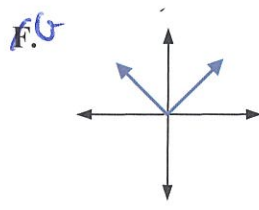
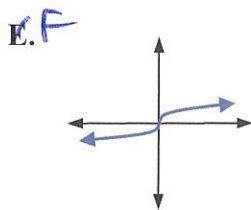
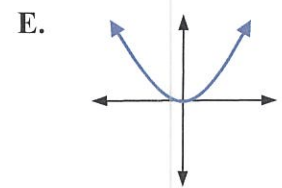
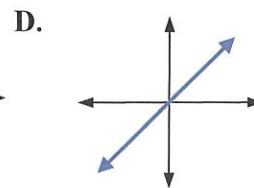
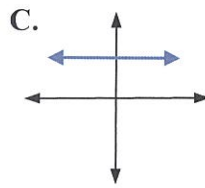
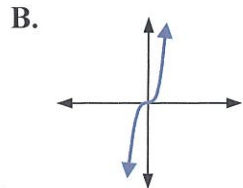
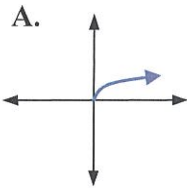
C Constant

A Square root

I Reciprocal

B Cube

G Absolute value



14) (2 points each) Short answer:

a) What makes a relation a function?

words

b) Explain why the Vertical Line Test determines if a graph is that of a function.

words

c) Fill in the blank: The change of the y -values per the change of the x -value of a linear function is called the slope.

d) Fill in the blank: The slope of the secant line between two points of a non-linear function is called the average rate of change.

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