

- 1) (4 points) Find the equation of the circle in standard form where the points (7,6) and (-5,1) are endpoints to a diameter of the circle

Center: $\left(\frac{7+(-5)}{2}, \frac{6+1}{2}\right) = \left(1, \frac{7}{2}\right)$ radius $r = \frac{d}{2} = \frac{\sqrt{(7-(-5))^2 + (6-1)^2}}{2} = \frac{13}{2}$

$$(x-1)^2 + \left(y - \frac{7}{2}\right)^2 = \left(\frac{13}{2}\right)^2 = \frac{169}{4}$$

- 2) (2 points) What is a function?

you know, that guy in that one movie...

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

a) $f(x) = 2x^2 + 26x + 24$

\mathbb{R}

b) $g(x) = \frac{2x+5}{2x^2-3x-14}$

$$2x^2 - 3x - 14 = 0$$

$$(2x-7)(x+2) = 0$$

$$x \neq \frac{7}{2}, -2$$

c) $h(x) = \frac{-4x+4}{\sqrt{9x+3}}$

$$9x+3 > 0$$

$$x > -\frac{1}{3}$$

- 4) (4 points) In class we discussed two of the three things you cannot do with real numbers. What were the first two and how do they help you find the domain of a function? Do not use examples in your answer.

1) Can't divide by zero: set the denominator to be zero and the solutions not in the domain

2) Can't take even root of a negative: set radical to be ≥ 0 and solve.

- 5) (5 points) The function $f(x) = -2x^2 + 23x + 20$ approximates the number of new words learned by a student in an Pig Latin 101 class where x is the number of weeks since the beginning of the semester. Find and interpret the average rate of change from $x=2$ to $x=8$.

$$\frac{P(8) - P(2)}{8-2} = \frac{76-58}{6} = 3$$

From week 2 to week 8, 3 new words were learned per week.

24

6) (3 points each) Consider the following data (source: Census.gov):

Year	2010	2011	2012	2013	2014	2015	2016
Percentage of people 25 years or older that have completed 4 years of college or more	29.9	30.4	30.9	31.7	32.0	32.5	33.4

Let x be the number of years since 2010 and let y be the percentage of people 25 years or older that have completed 4 years of college or more.

a) Find the equation of the regression line. Round values to two decimal places:

$$y = 0.56x + 29.85$$

b) Interpret the slope and y -intercept using the language of the problem:

"Bees?!"

- Gob Bluth

c) Predict the percentage of people that completed more than 4 years in the year 2017:

$$2017 - 2010 = 7$$

$$y = 0.56(7) + 29.85$$

$$= \boxed{33.77\%}$$

d) When will 40% of people 25 or older have completed 4 or more years of college?

$$40 = 0.56x + 29.85$$

$$x = 18.125$$

$$\boxed{\text{During 2028}}$$

7) (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

$$[-3, \infty)$$

c) Increases

$$(-3, 0) \cup (2, \infty)$$

d) Decreases

$$(-\infty, -3) \cup (0, 2)$$

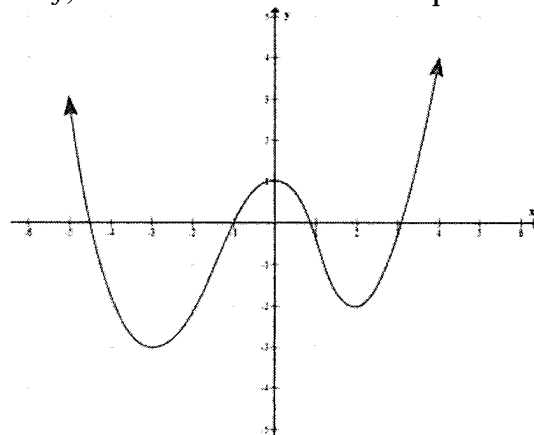
e) Relative Maxima

$$(0, 1)$$

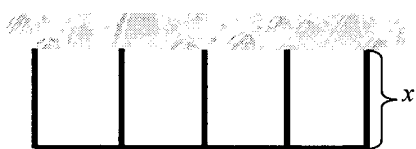
f) Relative Minima

$$(-3, -3)$$

$$(2, -2)$$



8) (5 points) A farmer has 600 feet of fence and wishes to enclose 4 adjacent rectangular pens that are all next to a river. The side against the river will not receive any fencing. Determine a function for the area of the entire enclosure in terms of the width x of the enclosure.



$$5x + y = 600 \Rightarrow y = 600 - 5x$$

$$A = xy = x(600 - 5x)$$

$$\boxed{A(x) = x(600 - 5x) = 600x - 5x^2}$$

3

9) (3 points each) For the functions $f(x) = \sqrt{x+4}$ and $g(x) = x^2 - 4$, find...

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

$$= \boxed{\sqrt{x+4} + x^2 - 4}$$

b) The domain of $(f-g)(x)$

$$D_f: x+4 \geq 0 \quad D_g: \mathbb{R}$$

$$\Rightarrow D_{f-g}: x \geq -4$$

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

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

$$= x+4-4$$

$$= \boxed{x}$$

d) The domain of $(g \circ f)(x)$

(see domain work in part b)

~~$D_{g \circ f}: x \geq -4$~~
 $D_{g \circ f}: x \geq -4$ since the domain of g is \mathbb{R} .

10) (6 points) For the function $f(x) = 2x^2 + 2x - 5$, find and simplify $\frac{f(x+h) - f(x)}{h}$:

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

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

11) (2 points) Find two functions f and g such that $f \circ g = H$ given that $H(x) = \sqrt[4]{8x^2 + 6} - 5$:

$$g(x) = 8x^2 + 6 \quad \text{multiply } 1$$

$$f(x) = \sqrt[4]{x} - 5 \quad \text{answers.}$$

12) (3 points) Determine algebraically if the function $f(x) = 12x|x|$ is even, odd, or neither.

$$f(-x) = 12(-x)|-x| = -12x \cdot |x| \quad \underline{\underline{\text{odd}}}$$

13) (2 points each) The ordered pair $(2, -9)$ is on the graph of $y = f(x)$. Find the corresponding ordered pair on the graph of $y = g(x)$ where...

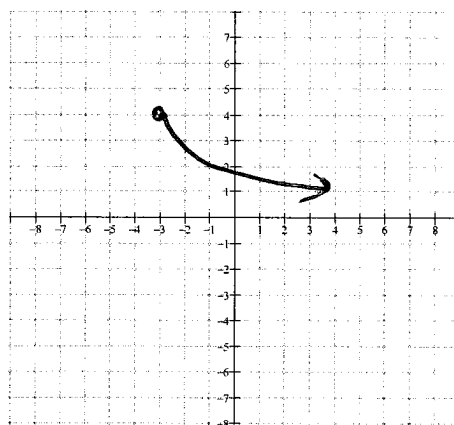
- a) $g(x) = f(x) + 5$ b) $g(x) = \frac{4}{3}f(x)$ c) $g(x) = f(x-3)$ d) $g(x) = f(-x)$
- $(2, -4)$ $(2, -12)$ $(5, -9)$ $(-2, -9)$

14) (3 points each) For the function $f(x) = -\sqrt{x+3} + 4 \dots$

a) Explain, in order, the steps needed to sketch the graph:

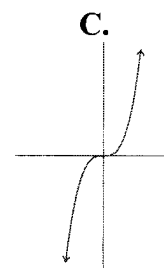
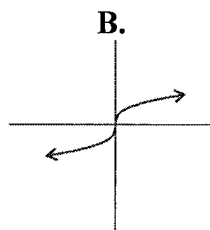
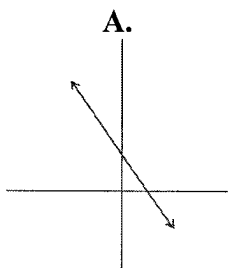
- 1) left 3
2) vertically reflect over x-axis
3) up 4

b) Sketch and label the graph:



15) (1 point each) Match the following functions with the best description or picture:

- | | | |
|-------------------------|----------------------------------|----------------------------|
| <u>H</u> Constant | <u>A</u> Linear | <u>D</u> Identity |
| <u>C</u> Cube | <u>J</u> Square | <u>F</u> Square root |
| <u>B</u> Cube root | <u>E</u> R Reciprocal | <u>G</u> Piecewise-defined |
| <u>I</u> Absolute value | | |



- D. The graph bisects the first and third quadrants E. Has vertical and horizontal asymptotes at the x- and y-axis F. The graph is half of a parabola
- G. Made up of other functions H. Same y-value for all x values I. The graph is a V-shaped curve
- J. The graph is a U-shaped curve