

- 1) (3 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 = $\frac{\text{diameter}}{2} = \frac{\sqrt{(-5-7)^2 + (1-6)^2}}{2} = \frac{\sqrt{169}}{2} = \frac{13}{2}$

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

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

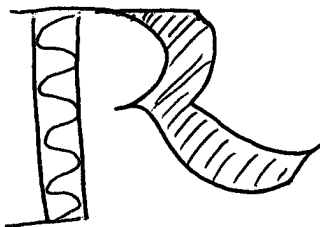
A warm slice of apple pie

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

a) $f(x) = x^2 + 13x + 12$

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

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



funny!

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

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

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

$$9x + 3 > 0$$

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

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

C'è una mela sul tavolo

- 5) (2 points) Find the equation of the line in slope-intercept form that passes through the points (10,6) and (-2,7).

$$m = \frac{7-6}{-2-10} = -\frac{1}{12}$$

$$y - 7 = -\frac{1}{12}(x - (-2))$$

$$y = -\frac{1}{12}x + \frac{41}{6}$$

- 6) (5 points) The function $f(x) = -x^2 + 15x + 20$ 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 $x=8$.

$$\frac{f(8) - f(2)}{8 - 2} = \frac{76 - 46}{8 - 2} = 5$$

5 new words are learned per week from the 2nd to 8th week.

- 7) (3 points each) The percent of cell phone users that use the Facebook app is given below:

Month (during the year 2015)	May	June	July	August	September	October	November
Percent	70.2	71.8	73.3	75.4	76.2	77.3	77.2

Let x represent the number of months since **December 2014** and let y represent the percent of Facebook app users.

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

$$y = 1.25x + 64.51$$

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

insert words here

- c) During what month and year will the percent of Facebook app users hit ~~83%~~ ^{83.1}?

$$83.1 = 1.25x + 64.51$$

$$\Rightarrow x = 14.792$$

February 2016

- d) Predict the percent number of app users in October 2016.

$$x = 22$$

$$y = 1.25(22) + 64.51$$

$$= \boxed{92.01\%}$$

- 8) (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

$$(-\infty, \infty)$$

- b) The Range

$$[-3, \infty)$$

- c) Increases

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

- d) Decreases

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

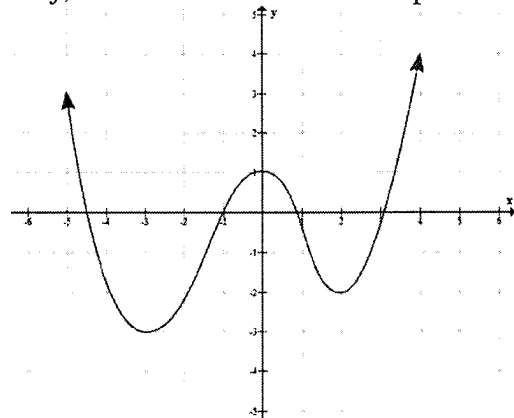
- e) Relative Maxima

$$(0, 1)$$

- f) Relative Minima

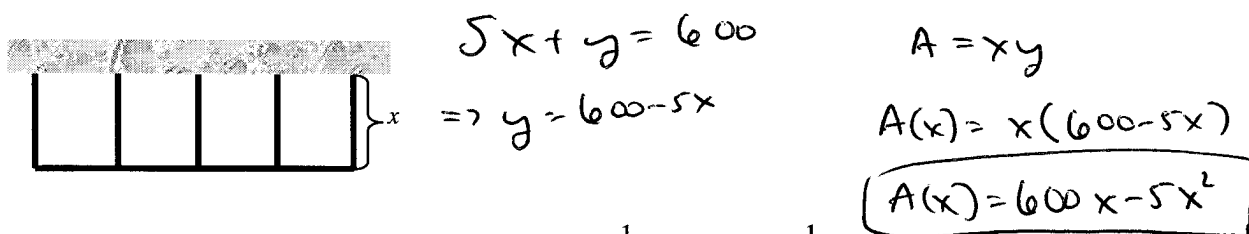
$$(-3, -3)$$

$$(2, -2)$$



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- 9) (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.



- 10) (3 points each) For the functions $f(x) = \frac{1}{x}$ and $g(x) = \frac{1}{x} - 9$, find...

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

$$= \frac{1}{x} + \frac{1}{x} - 9 = \boxed{\frac{2}{x} - 9}$$

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

$$D_f: x \neq 0 \quad D_g: x \neq 0$$

$$\boxed{D_{f-g}: x \neq 0}$$

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

$$\frac{1}{\frac{1}{x}} - 9$$

$$= \boxed{x - 9}$$

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

$$D_f: x \neq 0$$

$$D_g: x \neq 0$$

since $\frac{1}{x} \neq 0$ then

$$\boxed{D_{g \circ f}: x \neq 0}$$

- 11) (6 points) For the function $f(x) = 2x^2 + 2x - 5$, find and simplify $\frac{f(x+h) - f(x)}{h}$:

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

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

- 12) (2 points) Find two functions f and g such that $f \circ g = H$ given that $H(x) = \frac{-6}{3x^2 + 8} + 6$:

$$f(x) = \frac{-6}{x} + 6$$

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

multiple answers.

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13) (2 points each) The ordered pair $(1, -6)$ is on the graph of $y = f(x)$. Find the corresponding ordered pair on the graph of $y = g(x)$ where...

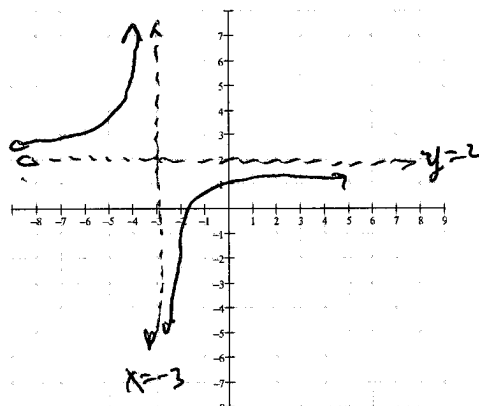
- a) $g(x) = f(x) - 3$ b) $g(x) = \frac{2}{3}f(x)$ c) $g(x) = f(x-4)$ d) $g(x) = f(-x)$
- $(1, -9)$ $(1, -4)$ $(5, -6)$ $(-1, -6)$

14) (4 points each) For the function $f(x) = \frac{-1}{x+3} + 2$...

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

- 1) left 3
2) Reflect over x-axis
3) up 2

b) Sketch and label the graph:



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

E Constant

A Linear

D Identity

B Cube

F Square

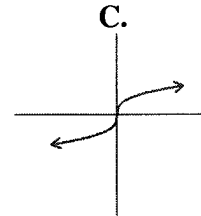
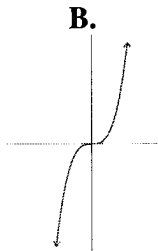
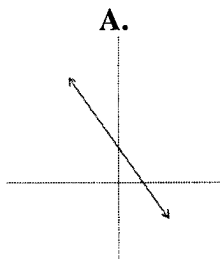
I Square root

C Cube root

G Reciprocal

J Piecewise-defined

H Absolute value



D. The graph bisects the first and third quadrants

E. Same y-value for all x values

F. The graph is a U-shaped curve

G. Has vertical and horizontal asymptotes at the x- and y-axis

H. The graph is a V-shaped curve

I. The graph is half of a parabola

J. Made up of other functions

JL