Accelerated Algebra 2
Study Guide: Unit 1

Bathtub Problem

You pull out the plug from the bathtub. After 40 seconds, there are 13 gallons of water left in the tub. One minute after you pull the plug, there are 10 gallons left. Assume that the number of gallons varies linearly with the time since the plug was pulled.

a. Create a table to show the information mentioned above.

time(s)	# gallons
40	13
60	10

b. Find a model (write a linear equation) for the number of gallons (g) left in the tub in terms of the number of seconds (s) since you pulled the plug.

$m = \frac{10-13}{60-40} = \frac{-3}{20}$

$g - 10 = \frac{-3}{20}(t - 60)$

$g - 10 = \frac{-3}{20}t + 9$

$\boxed{g = \frac{-3}{20}t + 19}$

c. At what time will there be 7 gallons left in the tub?

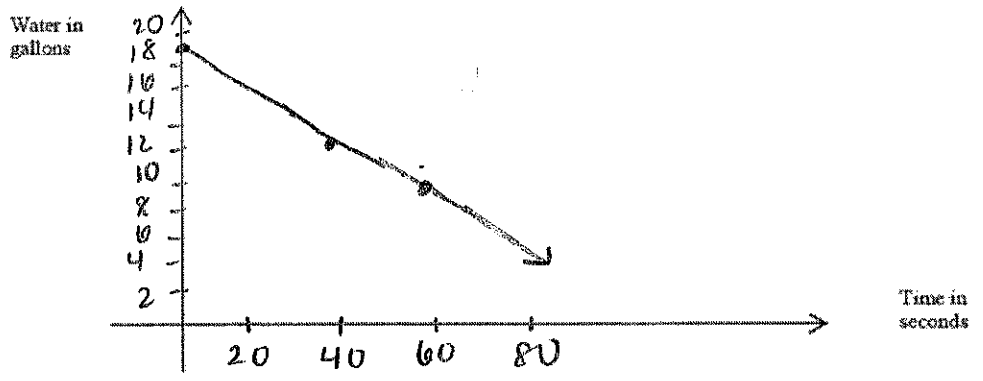
$7 = \frac{-3}{20}t + 19$

$-12 = \frac{-3}{20}t$

$t = \frac{240}{3} = 80$

After 80 seconds, there will be 7 gallons left.

d. Plot the graph of this linear function.



e. What is the rate of change? What does this number represent?

$-3/20$ represents a decrease by 3 gallons every 20 seconds

Two Jobs

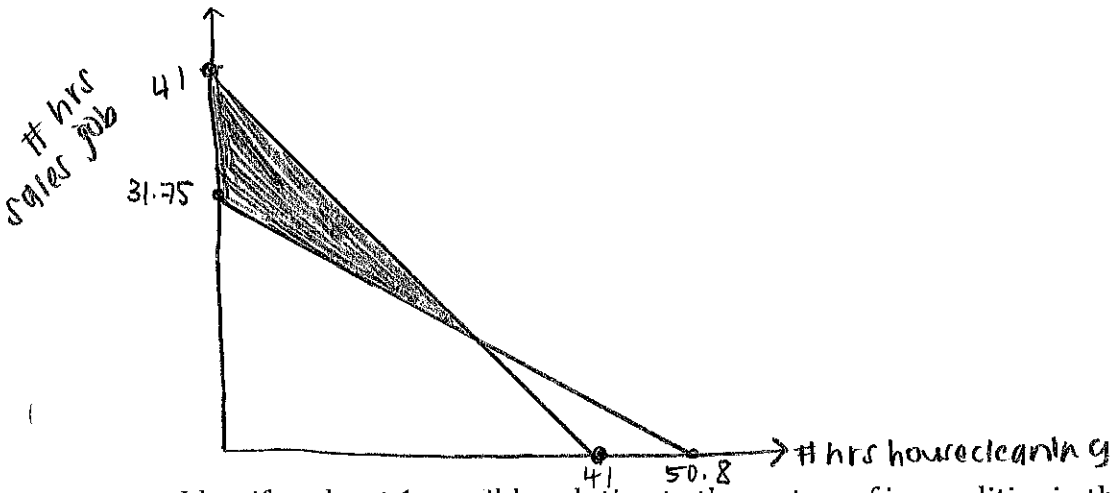
You can work a total of no more than 41 hours each week at your two jobs. Housecleaning pays $5 per hour and your sales job pays $8 per hour. You need to earn at least $254 each week to pay your bills. X = # hours housecleaning Y = #hours sales job

a. Write a system of inequalities to model this situation.

$x + y \leq 41$

$5x + 8y \geq 254$

b. Graph the system of inequalities.



c. Identify at least 1 possible solution to the system of inequalities in the context of this question. Explain why you chose that solution.

* Be sure point lives in shaded region

d. Can you work for 18 hours housecleaning and 15 hours in sales to earn enough money to pay bills? Explain.

$5(18) + 8(15) = 210$

No, since you would only have $210, not $254.

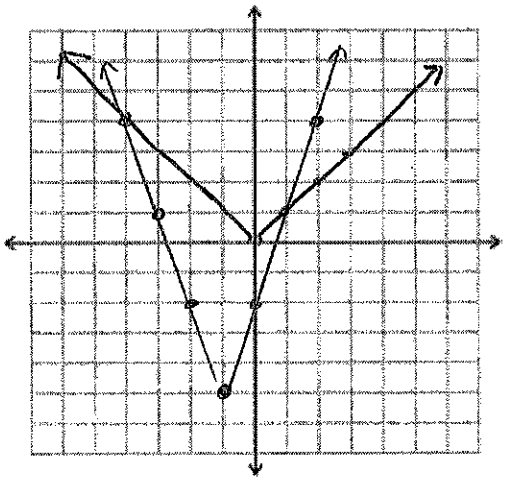
Absolute Value

Let $f(x) = |x|$ be the original equation (parent function) and let $g(x) = 3|x + 1| - 5$ be the transformed equation.

a. Describe the transformations happening in $g(x)$.

vertical stretch of 3
translated left 1 and down 5

b. Graph both $f(x)$ and $g(x)$ on the coordinate axis below.



c. Identify the domain and range of $g(x)$.

D: $\mathbb{R}$

R: $y \geq -5$

d. Identify any intersections between f and g.

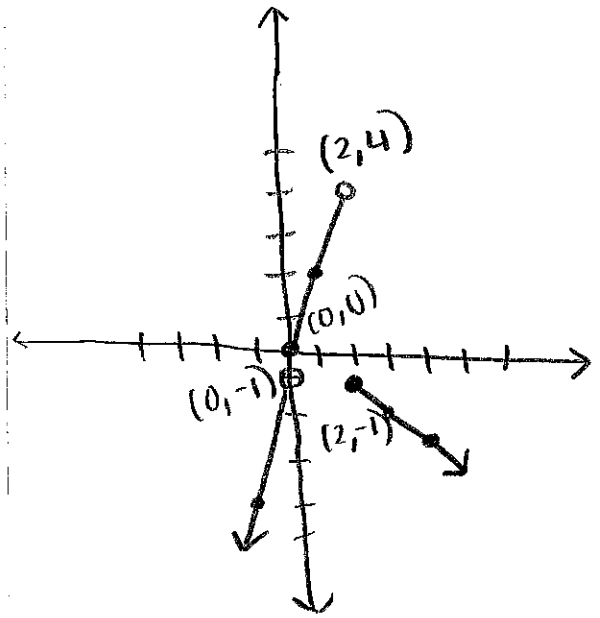
$x = -4$ and $x = 1$

Piecewise Problem

$$f(x) = \begin{cases} 3x-1, & x<0 \\ 2x, & 0 \leq x < 2 \\ -x+1, & x \geq 2 \end{cases}$$

D: $\mathbb{R}$

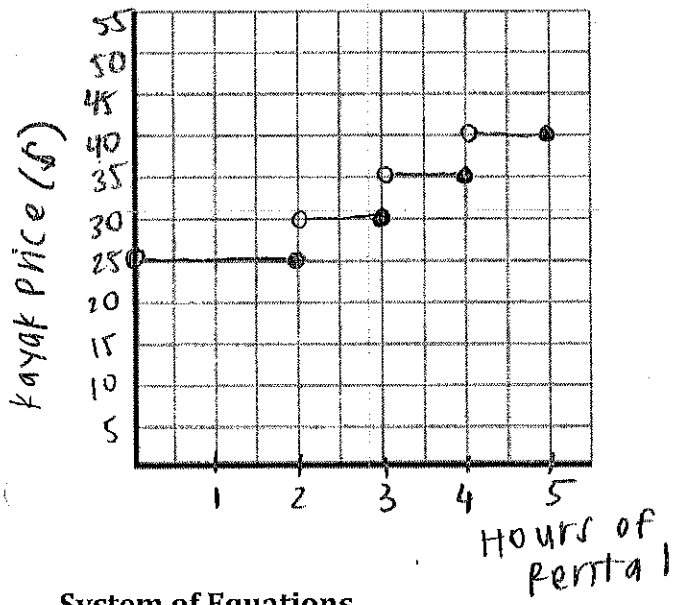
R: $y \leq -1$ or $0 \leq y < 4$



Kayak Rental Problem

A kayak rental place charges $25 for a single kayak for the first 2 hours. The price goes up by 5 dollars for each additional hour or fraction thereof.

a) Graph the cost of renting a kayak for up to 5 hours. Scale and label the axes with appropriate units.



Write the piecewise function that models the price for up to 5-hour rental.

$$f(x) = \begin{cases} 25, & 0 < x \leq 2 \\ 30, & 2 < x \leq 3 \\ 35, & 3 < x \leq 4 \\ 40, & 4 < x \leq 5 \end{cases}$$

System of Equations

Solve the system below. Write the solution as an ordered triple.

$2x + 7y + z = -53$
$-2x + 3y + z = -13$
$6x + 3y + z = -45$

$2x + 7y + z = -53$
$2x - 3y - z = 13$
$4x + 4y = -40$

$6x + 3y + z = -45$
$2x - 3y - z = 13$
$8x = -32$
$x = -4$

$4(-4) + 4y = -40$
$-16 + 4y = -40$
$4y = -24$
$y = -6$

$2(-4) + 7(-6) + z = -53$
$-8 - 42 + z = -53$
$-50 + z = -53$
$z = -3$

$(-4, -6, -3)$