

april ~

6	NO SCHOOL - Power Outage
7	NO SCHOOL - GOOD FRIDAY
10	NO SCHOOL - EASTER MONDAY
11	In-Class Assignment AND Creation of Memory Aid
12	MTH-3051: Algebraic and Graphical Modelling - L9 - Linear Function 2
13	Take-up In-Class Assignment
14	MTH-3051: Algebraic and Graphical Modelling - L10 - Graphing Linear Functions and Rational Functions
17	MTH-3051: Algebraic and Graphical Modelling - L11 - Rational Functions and the Inverse of Functions and More Explicit Knowledge Questions Involving Linear Functions
18	MTH-3051: Algebraic and Graphical Modelling - L12 - Solving Systems using Comparison Method. Task Involving the Point of Intersection between Two Linear Functions.
19	MTH-3051: Algebraic and Graphical Modelling - L13 - Tasks Involving Linear Functions and Inequalities and Review
20	Review (creation of memory aid)
21	Pre-test
24	Take-up Pre-test
25	Practice Pre-test
26	NO SCHOOL - PEDAGOGICAL DAY
27	EXAM

Recall:

8- Graphing Lines and Rational Functions - April 7, 2021

Math-3051-2

Graphing Rational Functions

1. Create a table of values with a wide sample of x values (at least 5)
2. Find the y value for each x value
3. Plot each point on the graph
4. Draw a curve through the points

$f(x) = \frac{64}{x}$ where $x \neq 0$

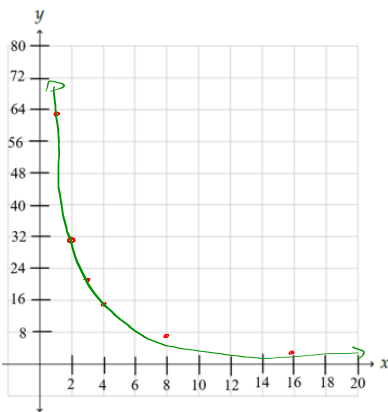
$f(0) = \frac{64}{0}$

4.3.1 Practice

Graph the following rational function:

$f(x) = ax + b$

$f(x) = \frac{64}{x}$



independent variable

#s that are divisible by 64

x	y
0	
1	64
2	32
3	21.3
4	16
8	8
9	7.1

Error (undefined $\neq 0$)

(-32) + a
(-10.7) + a
∴ not linear function (check if rational by multiplying the x's and y's)

2x y
1x64 = 64
2x32 = 64
3x21.3 = 64
4x16 = 64
8x8 = 64
9x7.1 = 64
constant ∴ rational

$f(9) =$
 $f(x) = \frac{64}{x}$
 $f(9) = \frac{64}{9}$
 $f(9) = 7.1$

find $f(0)$
 $f(x) = \frac{64}{x}$
 $f(2) = \frac{64}{2}$
 $f(2) = 32$

find $f(1)$
 $f(3) = \frac{64}{3}$
 $= 21.3$

"find y when x = 1"

$f(x) = \frac{64}{x}$

$f(1) = \frac{64}{1}$

$f(1) = 64$

$f(4) = \frac{64}{4}$

$f(4) = 16$

$f(8) = \frac{64}{8}$

$f(8) = 8$

$f(9) = 8$

Lesson 11: Finding the Equation of a Rational Function and Exp Knowledge for April 17, 2024

4.2.1 Determining Whether A Relation Presented in a Table is a Rational Function

Linear Function

$$a = \frac{y_2 - y_1}{x_2 - x_1}$$

Given the following relations, determine whether they are rational functions:

①

x	2	5	8
f(x)	125	50	$\frac{125}{4}$

• 250 250 250
 • ∴ rational!

② $a = -\frac{20}{2} = -10$ ③

x	2	4	6	8
f(x)	40	20	0	-20

30 80 0 -160
 ↳ not constant
 ∴ not rational

x	f(x)
2	5
3	$\frac{10}{3}$
4	$\frac{5}{2}$
5	2
10	1

∴ rational

→ check by $x \times y$

• if the product is constant, then f(x) is rational!

4.2.2 Determining Whether A Relation Presented in a Table is a Rational Function

Given the following relations, determine whether they are rational functions:

①

x	f(x)
-5	2
-4	5
-3	8
-2	11

②

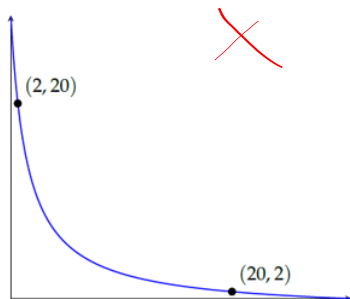
x	1	5	10	25
f(x)	250	50	25	10

③

x	1	2	4	8
y	32	16	8	4

4.4 Determining the Rule of a Rational Function

How can we find the rule of the following function?



*you do as
practice*

Determine the Rule/Equation of a Rational Function

$$y = \frac{a}{x}$$

$x \uparrow$
 $y \downarrow$

4.3 Example

A local high school is renting a bus in order to attend a field trip to a museum. The cost is divided equally among the number of passengers. Here are some possibilities:

- Key words:
• splitting
• dividing

The number of passengers	2	5	20
Cost per passenger (\$)	87.50	35	8.75

$$\frac{23}{7.61} \approx 5$$

\therefore Rational Function

a) The school is anticipating 20 students and 3 teachers will attend the field trip. What is the approximate cost per passenger?

WANT: y when $x=23$

Find a :

$$y = \frac{a}{x} \quad \text{sub } (2, 87.50)$$

$2 \times 87.50 = \left(\frac{a}{2}\right) \times 2$ solve for a by isolating it by \div o.o. opposite operations.

$$175 = a$$

state equation

$$y = \frac{a}{x}$$

$$y = \frac{175}{x}$$

use equation find y when $x=23$

$$y = \frac{175}{23}$$

$$y = 7.61 \text{ \$}$$

ANS: if 23 ppl go, the cost per person is \$7.61.

TOOL: equation

$$y = \frac{a}{x}$$

INFO: $x=23$
 $a=?$

WANT: a

TOOL: $y = \frac{a}{x}$

INFO:

a point $(2, 87.50)$
 x y

b) If each passenger pays \$5, how many people are attending the field trip to the museum?

WANT: x when $y=5$

find x when $y=5$

$$y = \frac{175}{x} \quad \text{sub in}$$

$$5 = \frac{175}{x}$$

$$5 \cdot x = \frac{175}{5}$$

$$x = 35 \text{ ppl}$$

Solve for x , but x is in denominator, so... cross-multiply

solve x o.o.

\therefore 35 ppl are attending if each are paying \$5

TOOL: equation - rational

$$y = \frac{a}{x}$$

$$y = \frac{175}{x}$$

INFO have all info

You do Practice 4.4

You do Ex 4.4 - Practice 4.4.1 a) b)

from L10 handout and check answers

4.4 Practice

A competition for the most innovative board game design is offering a cash prize divided equally among the winning team members. Here are some possible winning situations:

The number of team members	25	50	100
Prize per team member (\$)	2400	1200	600

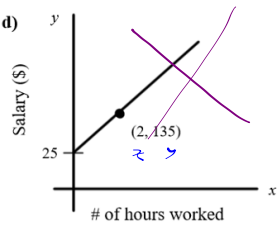
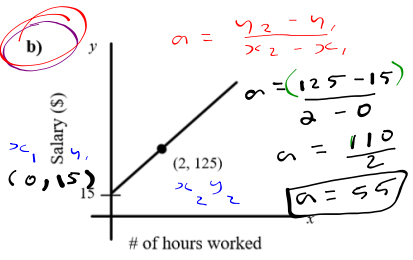
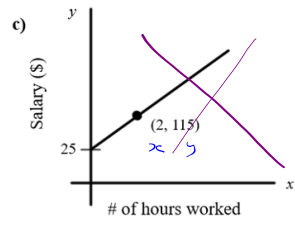
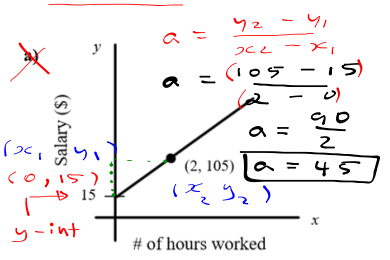
a) If each team member received \$1000 how many team members did the winning team have?

b) If the winning team had 12 members, what would be the prize money for each member?

Review: Linear Function: $y = ax + b$

Lesson 11: Handout 2. $= a \text{ \$/hr}$
Question 1: Roberto is a plumber who charges his customers \$45 per hour plus an additional \$15 for travel expenses. If Roberto increases his hourly rate by \$10, determine which graph models this new salary situation.

$a = \text{slope}$
 $b = y\text{-int}$
 $a = \frac{y_2 - y_1}{x_2 - x_1}$
 $(x=0)$ (initial value of the function)
 $(0, b)$
 (x, y)
 $x = \text{\# of hrs worked}$
 $y = \text{salary (\$)}$



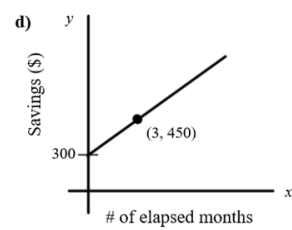
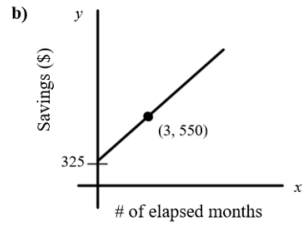
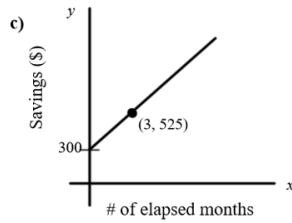
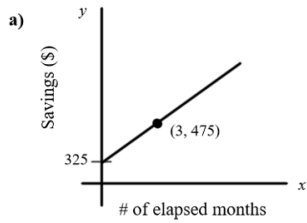
equation models
 old: $y = 45x + 15$
 new: $y = 55x + 15$
 $y = ax + b$
 $a = 55$ $b = 15$
 use to eliminate options

find slopes of remaining graphs

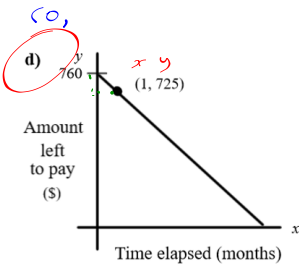
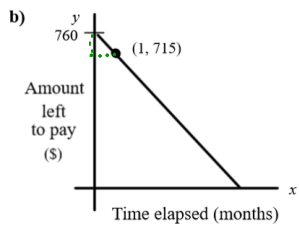
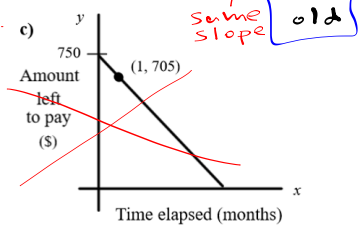
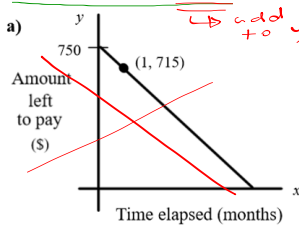
\therefore the point is on the line.

You do #2 and #3

Question 2: Kashana is going on a trip. She has saved \$300 and plans to add \$50 a month to her savings. If Kashana increases her monthly savings by \$25, determine which graph models this new savings situation.



Question 3: Antonia decides to purchase a cellphone because of an attractive financing option that allows her to pay for the phone in monthly installments. Each month she will pay \$35 to reimburse the cost of the \$750 cellphone. A different offer allows her to pay the same monthly installments for a cellphone that costs \$10 more. Which graph models this second payment plan?



$x = \text{time months}$
 $y = \text{amount left to pay (\$)}$
 $a = \$35 \text{ each month}$
 $\$35 \text{ per month}$
 $35 \text{ \$/m}$
 $a = -35$
 $b = y\text{-int when } x = 0$

$b = 750$
old : $y = -35x + 750$
new : $y = -35x + 760$

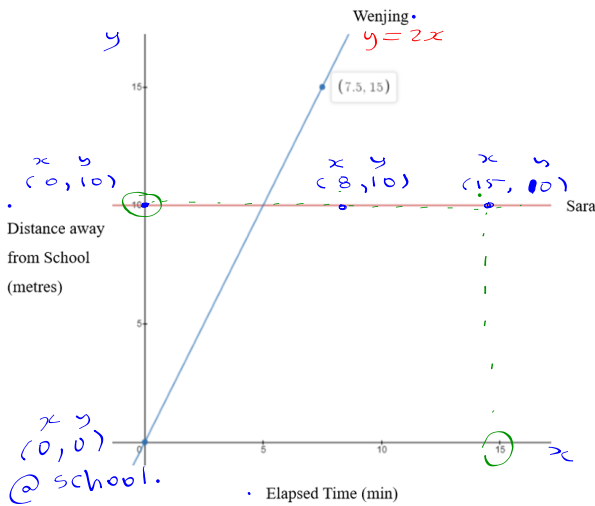
optional: here.
 12:15
 atelier for
 inverse

find slope

Review: Linear Functions and Reading Graphs

Practice Questions:

Question 1: Read the graph below that describes the position of each friend with respect to the school.
Answer the questions that follow.



- a) Initially, who is at school? (Wenjing)
- b) Is Sara get further away from school as the minutes go by? No
- c) Is Sara moving? No
- d) Find the equation that describes Wenjing's distance from school as a function of time.

• linear or rational function.

$$y = ax + b$$

$a = \text{slope}$ $b = \text{y-int}$
 \rightarrow need 2 points
 $P_1(0,0)$ $P_2(7.5,15)$
 x_1, y_1 x_2, y_2
 $y \text{ int: } (0,0)$
 $(0, b)$

$$a = \frac{y_2 - y_1}{x_2 - x_1} = \frac{15 - 0}{7.5 - 0} = 2$$

$$b = 0$$

$$y = 2x + 0$$

$$y = 2x$$

- e) Calculate how far Wenjing will be from school after 8 mins. = x
distance = y

sub $x = 8$

$$y = 2x$$

$$y = 2(8)$$

$$y = 16 \text{ m}$$

ANS: She's 16m away from school after 8 min.

WANT: y when x = 8
 TOOL: equation $y = ax + b$
 $y = 2x$
 INFO: have all info

- f) Calculate how long it will take Wenjing to be 5 meters from school.

sub $y = 5$

$$y = 2x$$

$$5 = 2x$$

solve / isolate w/ o.o.

$$2.5 = x$$

$$x = 2.5 \text{ min}$$

WANT: x when y = 5
 TOOL: equation $y = 2x$
 INFO

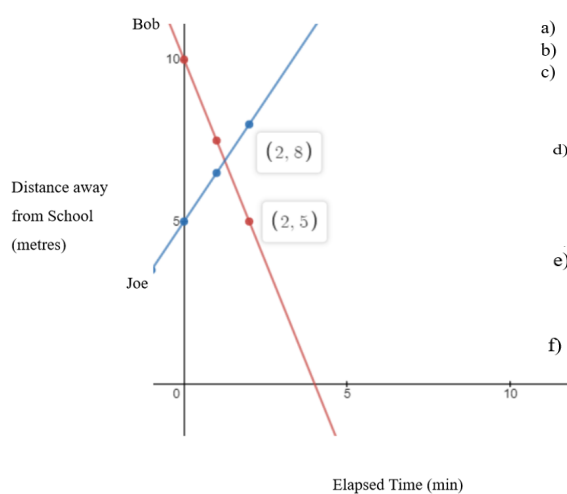
• You do Q2 and Q3

• You do AMWK for rational function:
 pg 82 # 2.13
 pg 105 # 2.27
AND finish handout from L10

\rightarrow check answers

\rightarrow ask questions to teacher or tutor or peeps.

Question 2: Read the graph below that describes the position of each friend with respect to the school.
Answer the questions that follow.

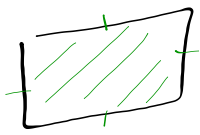


- Initially, who is closer to school?
- Who is walking towards school?
- What is the equation that describes Bob's distance from school as a function of time?
- What is the equation that describes Joe's distance from school as a function of time?
- How far is Bob from school after 3 minutes?
- How long will it take Bob to get to school?

The Inverse of a Function

Function : y depends on x

Inverse : how x depends on y (not necessarily a function)



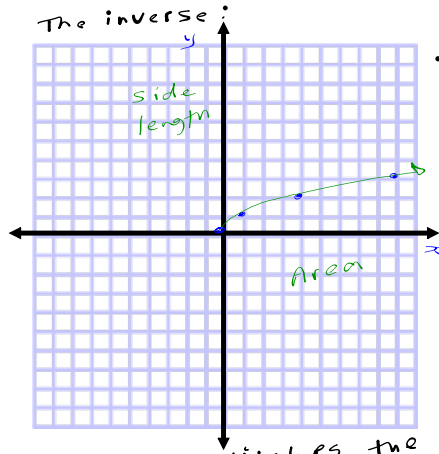
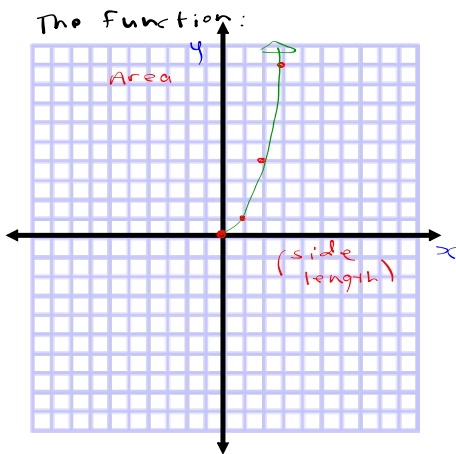
$$A = s^2$$

\uparrow \uparrow
 y x

$$\sqrt{A} = \sqrt{s^2}$$

$$s = \sqrt{A}$$

inverse of f



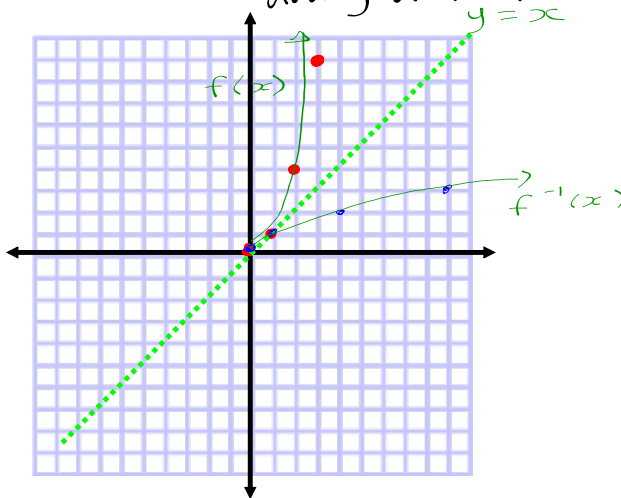
$f(x)$

x	$f(x)$
0	0
1	1
2	4
3	9

$f^{-1}(x)$

x	$f^{-1}(x)$
0	0
1	1
4	2
9	3

the inverse switches the x and y of the function.



Find the inverse of :

$$f(x) = -2x + 3$$

$$y = -2x + 3$$

$$y = ax + b$$

$$x = -2y + 3$$

$$x - 3 = -2y$$

$$\frac{x - 3}{-2} = \frac{-2y}{-2}$$

$$y = -\frac{1}{2}x + 1.5$$

$$f^{-1}(x) = -\frac{1}{2}x + 1.5$$

$$y = ax + b$$

← f

← f

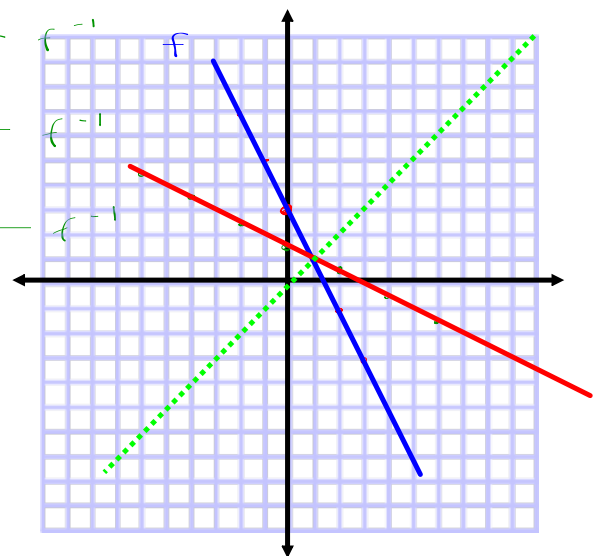
$$a = \frac{-2}{1} = \frac{\text{rise}}{\text{run}} \quad b = 3$$

← f⁻¹ (since switched x and y)

← f⁻¹

← f⁻¹

← f⁻¹



You can read more about inverse on pg 53 of textbook.