Review of domain and range...
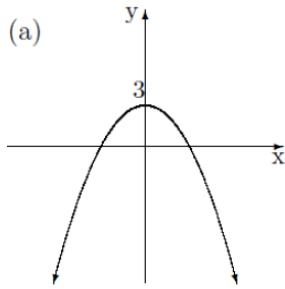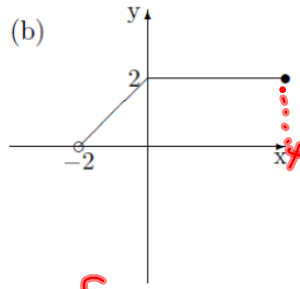
Find the domain and range of the following functions from the graph. Use correct set notation
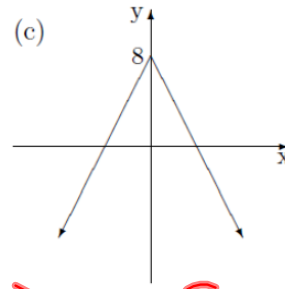
(a)

$D: \{x | x \in R\}$

$R: \{y | y \leq 3, y \in R\}$

(b)

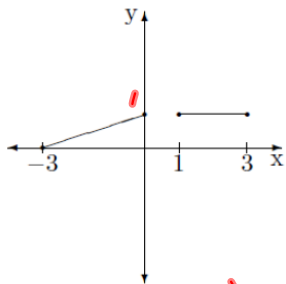$D: \{x | -2 < x \leq 4, x \in R\}$

$R: \{y | 0 < y \leq 2, y \in R\}$

(c)

$D: \{x \in R\}$

$R: \{y | y \leq 8, y \in R\}$

$D: \{x | -2 \leq x < 3, x \in R\}$

$R: \{y | -1 \leq y < 1, y \in R\}$

$g(x)$

$f(x) = -\frac{1}{x}$
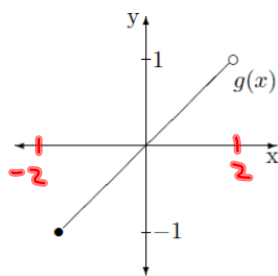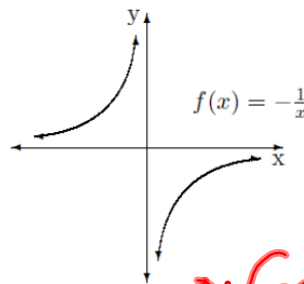
$D: \{x \in R, x \neq 0\}$

$R: \{y | y \in R, y \neq 0\}$

$D: \{x | -3 \leq x \leq 0 \text{ or } 1 \leq x \leq 3, x \in R\}$

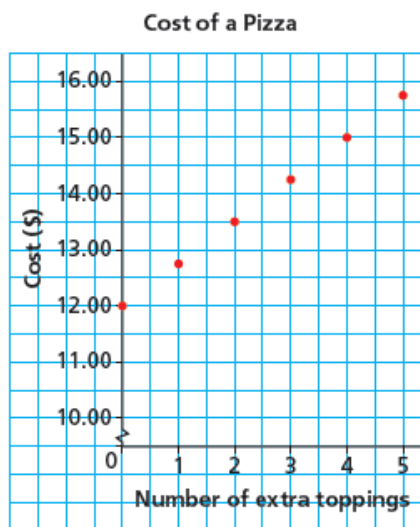$R: \{y | 0 \leq y \leq 1, y \in R\}$

1

5.6 Properties of Linear Relations

Identify and represent linear relations in different ways.

Make Connections

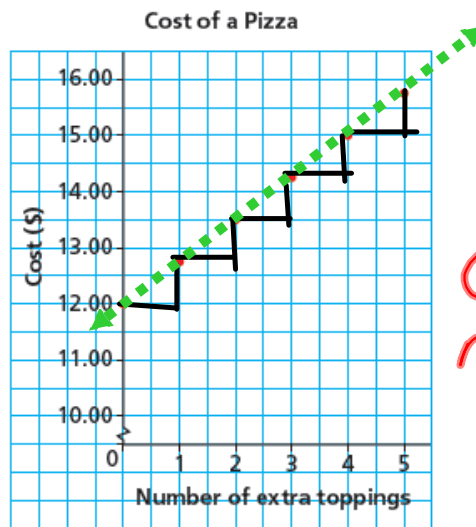The table of values and graph show the cost of a pizza with up to 5 extra toppings.

Number of Extra Toppings	Cost ($)
0	12.00
1	12.75
2	13.50
3	14.25
4	15.00
5	15.75

Cost of a Pizza

2

Number of Extra Toppings	Cost ($)
0	12.00
1	12.75
2	13.50
3	14.25
4	15.00
5	15.75

(handwritten annotations:) +1, 0.75, 0.75

$$C = n(0.75) + 12$$

Cost of a Pizza

(graph with y-axis "Cost ($)" ranging 10.00 to 16.00, x-axis "Number of extra toppings" from 0 to 5)

(handwritten:) C - Cost
n - # of toppings

What patterns do you see in the table?

Write a rule for the pattern that relates the cost of a pizza to the number of its toppings.

How are the patterns in the table shown in the graph?

How can you tell from the table that the graph represents a linear relation?

Here is another example of a linear relation...

The cost for a car rental is $60, plus $20 for every 100 km driven.
The independent variable is the distance driven and the dependent variable is the cost.
We can identify that this is a linear relation in different ways.

■ a table of values

Igd

	Distance (km)	Cost ($)	
Independent variable ⟶			⟵ Dependent variable
	0	60	
+100	100	80	+20
+100	200	100	+20
+100	300	120	+20
+100	400	140	+20

For a linear relation, a constant change in the independent variable results in a constant change in the dependent variable.
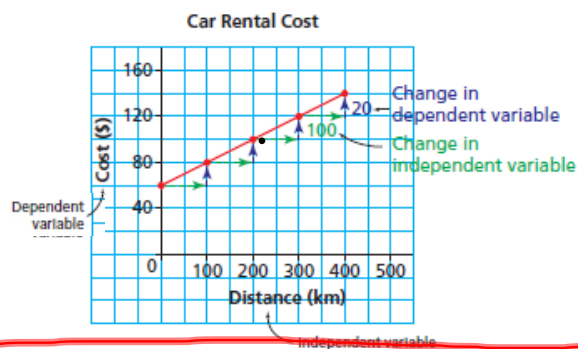
How to identify a linear relation...

- a set of ordered pairs

$$+100 \quad +100 \quad +100 \quad +100$$
$$\{(0, 60), (100, 80), (200, 100), (300, 120), (400, 140)\}$$
$$+20 \quad +20 \quad +20 \quad +20$$
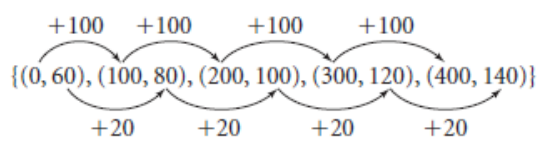
Why is it important that the ordered pairs are listed so their first elements are in numerical order?

- a graph

Car Rental Cost

Change in dependent variable
Change in independent variable
Dependent variable
Cost ($)
Distance (km)
independent variable

The graph of a linear relation is a straight line.

We can use each representation to calculate the **rate of change**.

The rate of change can be expressed as a fraction:

$$\frac{\text{change in dependent variable}}{\text{change in independent variable}} = \frac{\$20}{100 \text{ km}}$$

$$= \$0.20/\text{km}$$

5.6 Properties of Linear Relations

Which table of values represents a linear relation? Justify your answer.

a) The relation between the number of bacteria in a culture, n, and time, t minutes.

t	n
0	1
20	2
40	4
60	8
80	16
100	32

+20 +24 Non-Linear
+1 +2 Non-linear

b) The relation between the amount of goods and services tax charged, T dollars, and the amount of the purchase, A dollars

A	T
60	3
120	6
180	9
240	12
300	15

+60 +3

The rate of change is $0.20/km; that is, for each additional 1 km driven, the rental cost increases by 20¢. The rate of change is constant for a linear relation.

We can determine the rate of change from the equation that represents the linear function.

Let the cost be C dollars and the distance driven be d kilometres.

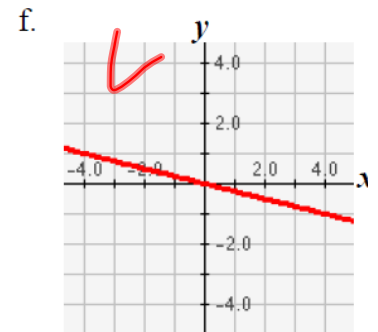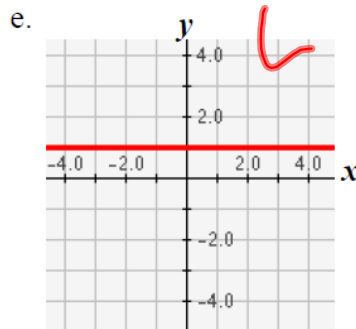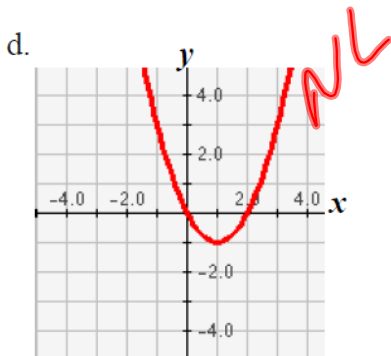An equation for this linear function is:
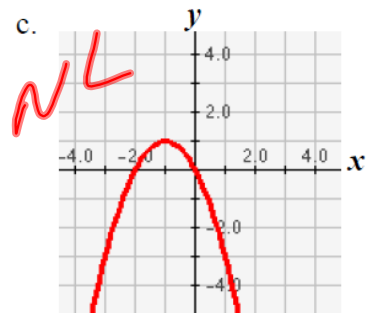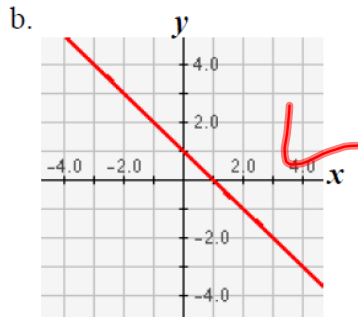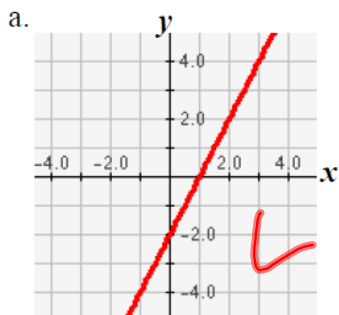
$$C = 0.20d + 60$$

- initial amount
- independent variable
- rate of change
- dependent variable

Dependent variable

1. State if each graph represents a linear or nonlinear relationship?

a.

L

b.

L

c.

NL

d.

NL

e.

L

f.

L

I. Using a table of values:

Using a Table of Values to Graph a Linear Relation Worksheet

Find the value of "y" in the following table(s) of values.

a)   y = x + 2   b) y = 2x + 1   c) y = 3x - 1   d) y = 2x

x	y
0	2
1	3
2	4
3	5
4	6

x	y
3	
4	
5	
6	
20	

x	y
8	23
9	26
10	29
11	32
25	74

x	y
2	
3	
4	
5	
100	

e) $y = \dfrac{1}{2}x + 2$

x	y
0	2
2	3
4	4
6	5
8	6

f) $y = \dfrac{1}{3}x - 3$

x	y
3	
6	
9	
12	

- Graph $y = 2x + 3$

x	y
0	3
1	5
-1	1

Graph the equation: $y = -3x + 5$