Math 10

Section 6.4. Functions

Focus:

1. To be able to sort relations into functions and non-functions.
2. To be able to use notation specifically designed for functions
3. To be able to graph linear functions.

Functions:

Up to now, we have been looking at relation. There is a special type of relation called a function. Functions are relations in which each x value (independent) is associated with EXACTLY one y value (dependent).

Functions can be written in a special format referred to as function notation.

Notation

f(x) replaces y

Standard Notation	Function Notation
y = 2x + 3	f(x) = 2x + 3
What is y when x is 4?	What is f(4)?
y = 2(4) + 3	f(4) = 2(4) + 3
y = 8 + 3	f(4) = 8 + 3
y = 11	f(4) = 11

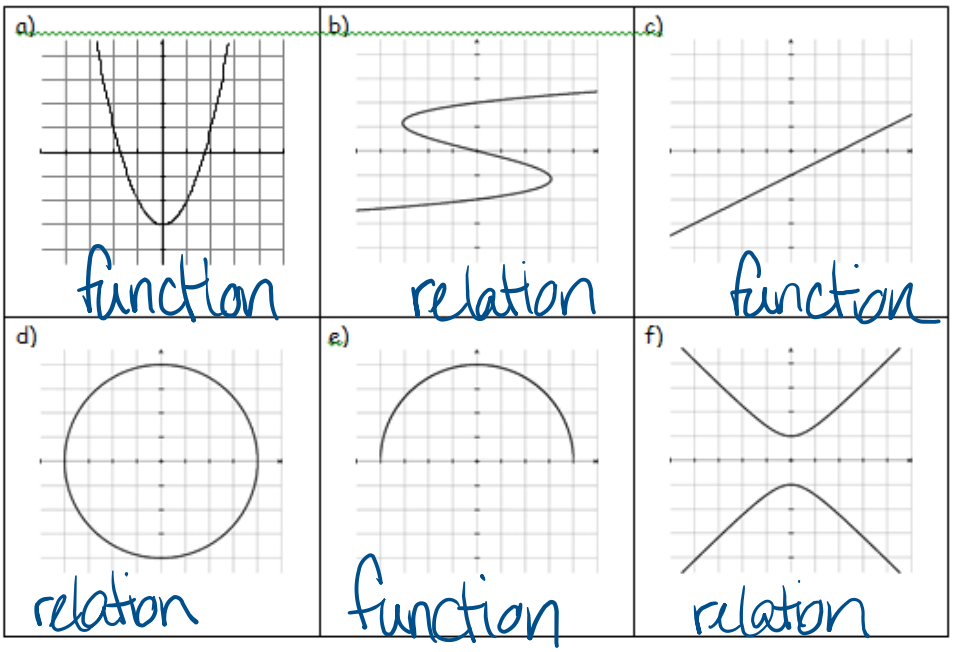
Final statement tells you the output only (it does not tell you what input produced this output).

Final statement tells you that an input of 4 produces an output of 11.

When is a Relation a Function?

To determine if a relation is a function, you have to look to see if there are multiple x values for a given y value. If that is the case, then we don't have a function. For data that is given in the form of a graph, we can use the vertical line test. To do the line test, draw a vertical line on the graph. If your pencil goes over more than one point then the relation is not a function.

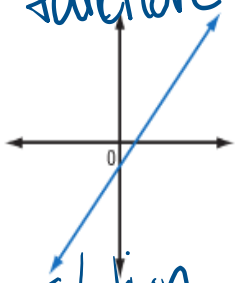
Which of the following relations are functions?



* Note: **ALL Functions** are RELATIONS but **NOT** all RELATIONS are **Functions**!

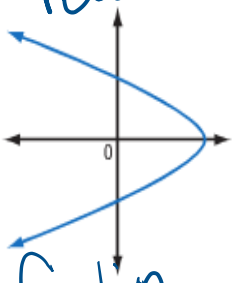
Example 1: For each pair of relations, decide which relation is a function and which is not a function. Explain your choice.

a) A



function

B



relation

b) C

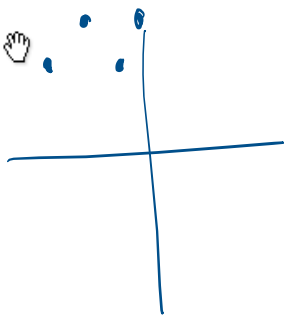
x	y
2	5
2	7
4	9
6	11

relation

D

x	y
−3	3
−2	4
−1	3
0	4

function



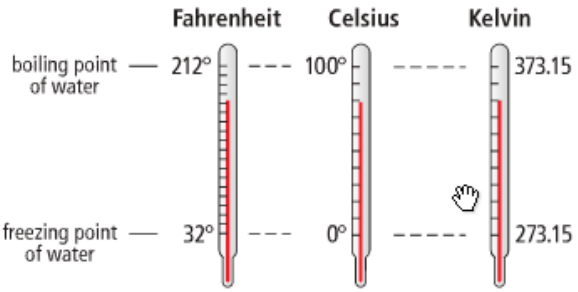
* y can repeat
x cannot

c) E {(1, 1), (2, 2), (3, 3), (4, 4)} function

F {(1, 1), (1, 2), (1, 3), (1, 4)} relation ~ x repeats

Example 2: Work with Function Notation:

The function F(C) = 1.8C + 32 is used to convert a temperature in degrees Celsius $(°C)$ to a temperature in degrees Fahrenheit $(°F)$.



a) Determine F(25). Explain your answer.

$F(25) = 1.8(25) + 32$

$= 77$

$25°C = 77°F$

b) Determine C so that F(C) = 100. Explain your answer.

$F(C) = 1.8C + 32$

$100 = 1.8C + 32$

$68 = 1.8C$

$C = 37.\overline{7}$

$37.7°C = 100°F$

c) Determine F(86). Explain your answer.

$F(86) = 1.8(86) + 32$

$= 186.8$

$86°C = 186.8°F$

d) Determine C so that F(C)=98.6. Explain your answer.

$98.6 = 1.8C + 32$

$66.6 = 1.8C$

$C = 37$

$37°C = 98.6°F$

e) Another measurement scale for temperature that is used in science is the Kelvin scale. The function K(C) = C + 273.15 can be used to convert from degrees Celsius to Kelvins. Determine K(80) and explain your answer.

$K(C) = 80 + 273.15$

$= 353.15$

$80°C = 353.15°K$

Example 3: If $f(x) = 3x - 1$, find:

a) f(2)

$f(x) = 3(2) - 1$

b) f(-6)

$f(x) = 3(-6) - 1$

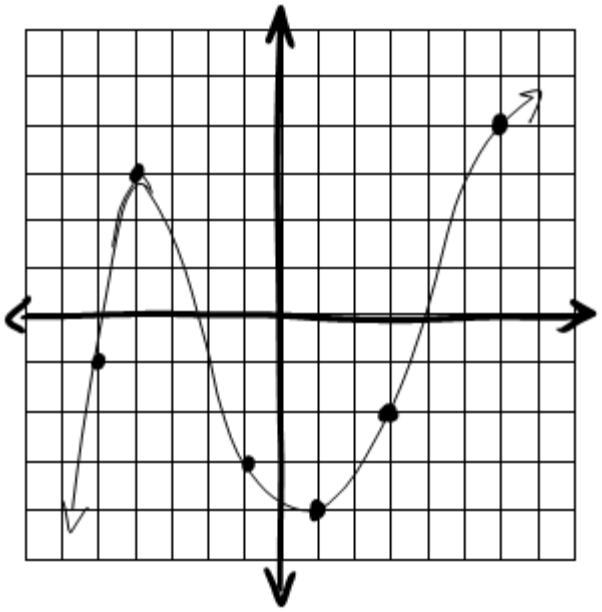
c) x if f(x)=-4

$-4 = 3x - 1$

d) f(2m)

$f(x) = 3(2m) - 1$

Example 4: Use the graph of f(x) to find:



a) f(-5)= -1

b) f(-1)= -3

c) f(1)= -4

d) f(3)= -2

e) f(6)= 4

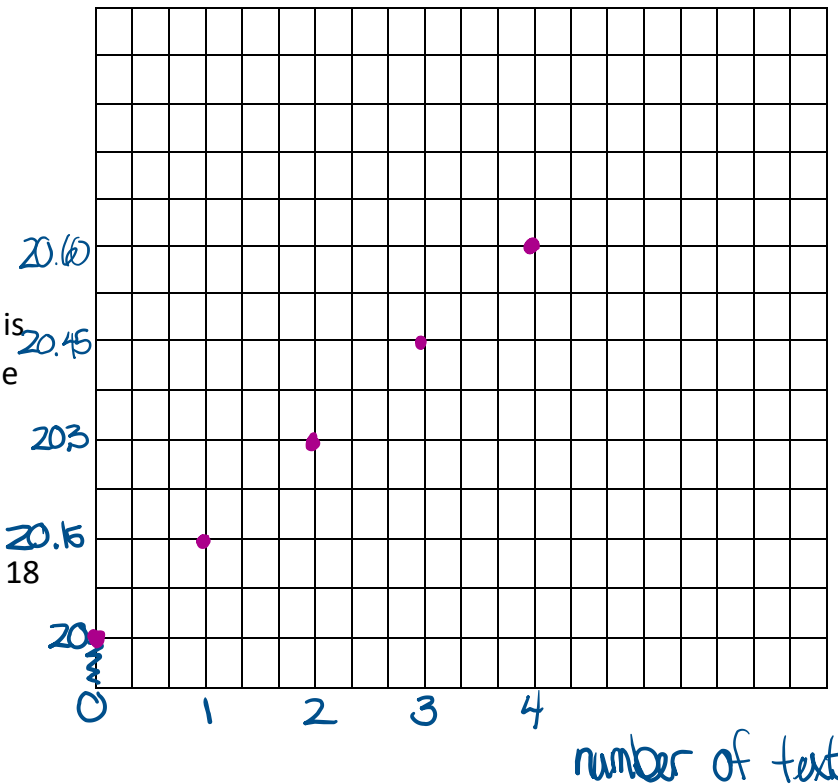
Example 5: Skye has a cell phone plan for a monthly fee of $20 plus 15 cents for each text message to or from a number not on a list of favourites. Skye's monthly bill can be modeled by the relation $C = 0.15n + 20$, where *C* is the total charge, in dollars, and *n* is the number of additional text messages.

a) Write the relation in function notation.

$f(n) = 0.15n + 20$

b) Make a table of values. Graph the function if Skye sends up to four additional text messages.

n	C
0	20
1	20.15
2	20.30
3	20.45
4	20.60



c) If Skye's cell phone bill for a certain month is $22.25, how many additional text message charges are there?

$22.25 = 0.15n + 20$

$2.25 = 0.15n$

$n = 15$

15 texts

Assign: P 311: 1, 2, 4, 6-8, 10, 12a, 14, 15, 17, 18