Lesson 3

Functions

Definition:
Function – a rule that gives a single output number for every valid input number.

Input → (X, Y) ← output

$f(x) = 3x + 1$

Input
output

Example 1:

Determine if the following is a function or not:

same input

(a) {(2, 3), (3, 4), (2, 5), (5, 6), (6, 7)} No! when x = 2, there are two "y" values
more than one output.

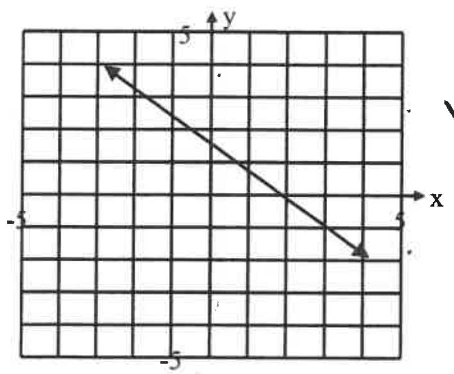
only matters if x repeats with different y

(b)

x	y
-1	-3
0	-2
1	-3
2	0

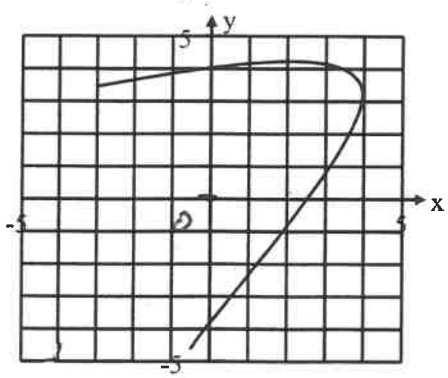
yes only one output (y) for every input.

(c)



Yes passes only one output given input.

(d)



No Does not pass vertical line test
same x values have more than one y value.

THE VERTICAL LINE TEST ALSO HELPS TO DETERMINE FUNCTIONS!

if a vertical line cross more than one point on graph then not a function b/c more than one output for given input

input value

$f(t)$

Definition:

Function Notation:

- To represent functions, we use symbols: f(x) , g(x) , h(x)
- f(x) reads "f of x". It means the equation is a function that has x as the input variable. output.
- f(x) is another name for y. For example: f(x) = 3x + 1 is the same as y = 3x + 1.

  If $x = 2$ then $f(2) = 2(2) + 1$ $f(2) = 4 + 1 = 5$
- Typically we are given a numerical value to SUBSTITUTE for x in the function.

Example 2:

a) If f(x) = -2x + 1, find the value of x if: (a) f(x)=12 (b) f(x)=-20

solve equations

a) $12 = -2x + 1$
$-1 \quad -1$
$11 = -2x$
$\div -2 \quad \div -2$
$\boxed{-5\tfrac{1}{2} = x}$

b) $-20 = -2x + 1$
$-1 \quad -1$
$-21 = -2x$
$\div -2 \quad \div -2$
$\boxed{x = 10\tfrac{1}{2}}$

b) Given $f(x) = 3x^2 - x - 6$, find: (a) f(2) (b) f(-1)

a) $f(2) = 3(2)^2 - 2 - 6$
$f(2) = 3 \cdot 4 - 2 - 6$
$f(2) = 12 - 8$
$\boxed{f(2) = 4}$

$f(-1) = 3(-1)^2 - (-1) - 6$
$f(-1) = 3 + 1 - 6$
$\boxed{f(-1) = -2}$

Evaluate the following expressions given the functions below:

$g(x) = -3x + 1$ $f(x) = x^2 + 7$ $h(x) = \frac{12}{x}$ $j(x) = 2x + 9$

a. $g(10) = -3(10) + 1$
$= -30 + 1$
$= -29$

b. $f(3) = 3^2 + 7$
$= 9 + 7$
$= 16$

c. $h(-2) = \frac{12}{-2}$
$= -6$

d. $j(7) = 2(7) + 9$
$= 14 + 9$
$= 23$

e. $h(a) = \frac{12}{a}$

f. $g(b+c) = -3(b+c) + 1$
$= -3b - 3c + 1$

h. Find x if $g(x) = 16$

$16 = -3x + 1$
$-1 \quad -1$
$15 = -3x$
$\div -3$
$\boxed{x = -5}$

i. Find x if $h(x) = -2$

$\frac{-2}{1} = \frac{12}{x}$
$x = \frac{12}{-2}$
$\boxed{x = -6}$

j. Find x if $f(x) = 23$

$23 = x^2 + 7$
$-7 \quad -7$
$\sqrt{16} = x^2$
$\boxed{x = 4}$

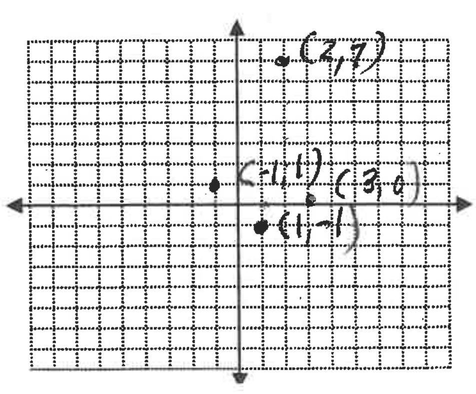
Change the following statements into coordinate points and then plot them!

a. $f(-1) = 1$ (-1, 1)

b. $f(2) = 7$ (2, 7)

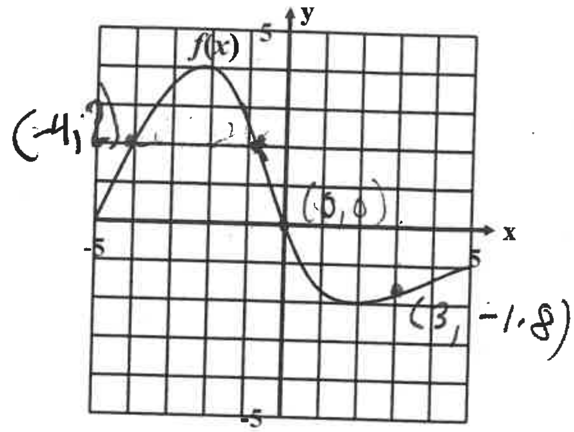
c. $f(1) = -1$ (1, -1)

d. $f(3) = 0$ (3, 0)



Example 3:

Given this graph of the function f(x):



Find:

a. $f(-4) =$ 2 **b.** $f(0) =$ 0 **c.** $f(3) =$ -1.8 **d.** $f(-5) =$ 0

e. x when $f(x) = -2$

$x = 2$

f. x when $f(x) = 0$

$x = -5, 0$

Example 4:

Fran collected data on the number of feet she could walk each second and wrote the following rule to model her walking rate $d(t) = 4t$.

a. What is $d(12)$? What does $d(12)$ mean?

Distance travelled in 12 seconds.

$d(12) = 4(12)$
$= 48$

The distance travelled is 48 ft.

b. What is $d(t) = 100$? What does $d(t) = 100$ mean?

$\frac{100}{4} = \frac{4t}{4}$ $t = 25$

The time to travel 100 ft. is 25 sec.

c. How can the function rule be used to indicate a time of 16 seconds was walked?

$d(16) = 4(16)$
$= 64$

4 16 seconds pass 64 ft walked.

d. How can the function rule be used to indicate that a distance of 200 feet was walked?

$d(t) = 200$

$\frac{200}{4} = \frac{4t}{4}$

$t = 50$ sec

The time to cover 200 feet is 50 sec

Example 5:

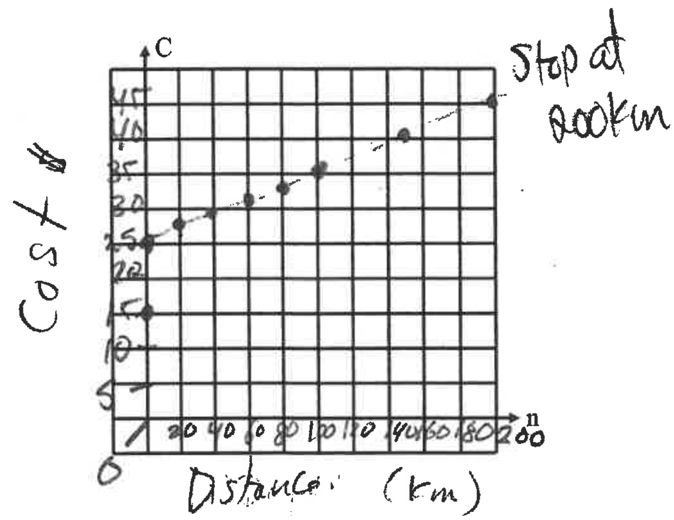
Trevor rents a car for a base fee of $25 per day plus 10 cents for each kilometre. Trevor's bill per day can be modelled by the relation C= 0.10n + 25, where C is the total charge, in dollars, and n is the number of kilometers.

(a) Write the relation in function notation.

$C(n) = 0.10n + 25$

(b) Make a table of values. Graph the function if Trevor drives up to 200 km in a day.

n	C
0	25
20	27
40	29
60	31
80	33
100	35
150	40
200	45



(c) If Trevor's bill was $27.50, how many kilometres did he drive that day?

$C(n) = \$27.50$ n = # km

$27.50 = 0.10(n) + 25$

$-25 \qquad\qquad -25$

$\dfrac{2.50}{0.10} = \dfrac{0.10n}{0.10}$

$n = 25$

Trevor drives 25km that day.

Assignment: ~~[illegible]~~

HW pg. 244 # 1 – 6, 8, 11a/b.

7a → domain

→ x values.