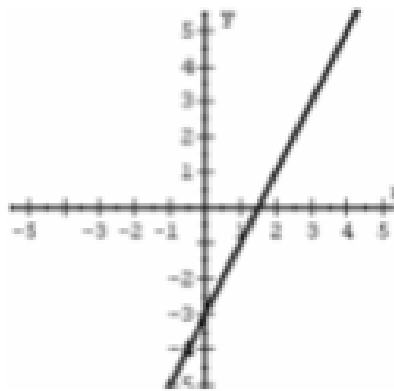# 4.1 Linear Functions
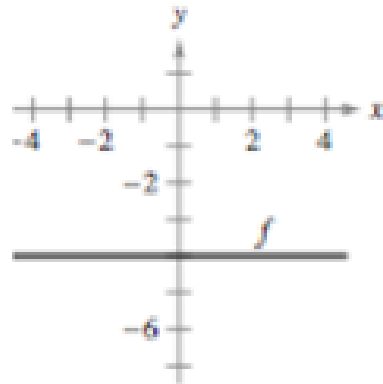
Linear Function: a function whose graph forms a **straight line**.
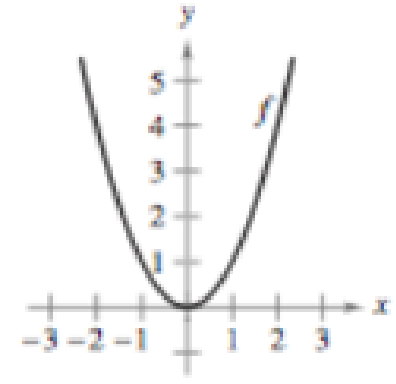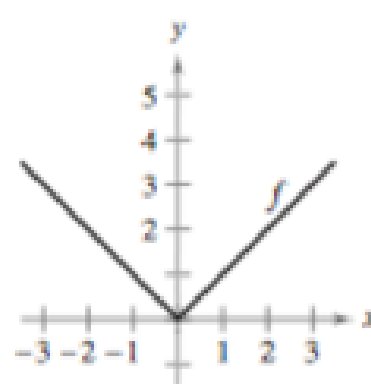
Linear Function   Linear
                         Function

                         Horizontal line

                         Constant Function

Not a Linear
because the graph
doesn't form a
straight line.

Ex1) Tell whether the given ordered pairs satisfy a function. If so, is it a linear function? Explain.

1) Table: 2) Find the difference

a) {(-2, 3), (-1, 1), (0, -1), (1, -3), (2, -5)}

Function; Linear Function because both x- and y-values have the Same difference.

x	y
-2	3
-1	1
0	-1
1	-3
2	-5

+1 on x side (Same), -2 on y side (Same)

-2 on x & y

Same

b) {(1, 2), (2, 3), (3, 4), (4, 6), (5, 7)}

Function; Not a Linear Function because the y-values don't have the same difference.

x	y
1	2
2	3
3	4
4	6
5	7

+1 on x side, +1 +1 +2 +1 on y side

+2 ← Not Linear

Standard Form of a Linear Equation: $\boxed{Ax + By = C,}$
where A, B and C are real numbers, A and B are not both 0,
and A must be positive.

Ex2) Write the following linear equation in $\boxed{\text{Standard Form.}}$
Then give the values of A, B, and C.

a) $y = \boxed{5x} + 3$ $\underline{Ax + By} = C$
$-5x$ $\uparrow$ $x \& y$ terms $\uparrow$
           move   must be on   #
           to the left   the left side

$-5x$

$-(-5x + y = 3)$

$\boxed{5x - y = -3 \; ; \; A = 5, B = -1, C = -3}$

b) $2\left(3x = \dfrac{y}{\boxed{2}} - 1\right)$ • multiply
                                          Everything by
                                          2.

$6x = y - 2$

$-y \quad -y$

$\boxed{\begin{array}{l} 6x - y = -2 \\ A = 6, B = -1, C = -2 \end{array}}$

Ex2) Write the following linear equation in Standard Form.

c) $\dfrac{(x-2)}{3} \cancel{\times} \dfrac{(y+1)}{2}$ cross multiply!!

$2(x-2) = 3(y+1)$

$2x - 4 = 3y + 3$

$\quad -3y \qquad -3y$

$2x - 3y - 4 = 3$

$\qquad +4 \qquad +4$

$\boxed{2x - 3y = 7}$

$A = 2, \; B = -3, \; C = 7$

d) $\dfrac{\boxed{x+3}}{④} \cancel{\times} \dfrac{\boxed{y+5}}{②}$

$2(x+3) = 4(y+5)$

$2x + 6 = 4y + 20$

$\quad -4y \qquad -4y$

$2x - 4y + 6 = 20$

$\qquad\qquad -6 \quad -6$

$\boxed{2x - 4y = 14}$

$A = 2; \; B = -4; \; C = 14$

Ex3) Tell whether a given equation is a Linear Equation:

- Both **x** and **y** must have **exponents of 1**.
- **x** and **y** are **not multiplied** together.
- **x** and **y** are **not** in the **denominators, exponents,** or **radical** signs.

a) $y = 2x - 3$

Linear

b) $4x - y = 5$

Linear

c) $3 - 2y = 5$

Linear

d) $xy = 2$

No

e) $2x - \dfrac{3}{y} = 1$

No

f) $y = \sqrt{x+1}$
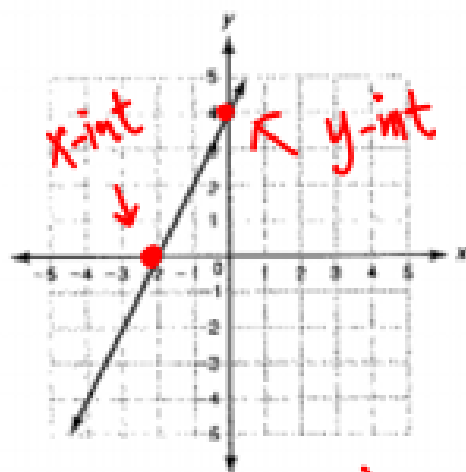
No

g) $y = 2x^2 - 3$

No

h) $y = |x| - 4$

No

i) $y = x^3$

No

4.2 Using Intercepts

- The **x-intercept** is the **x-coordinate** of the point where the graph **intercepts the x-axis**.

- The **y-intercept** is the **y-coordinate** of the point where the graph **intercepts the y-axis**.

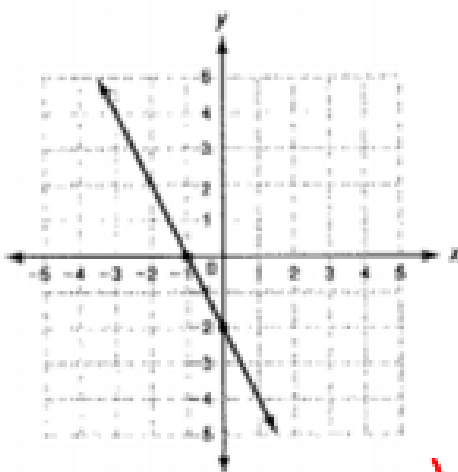**Ex4) Find the x- and y-intercepts.** (Show the answer in ordered pairs)
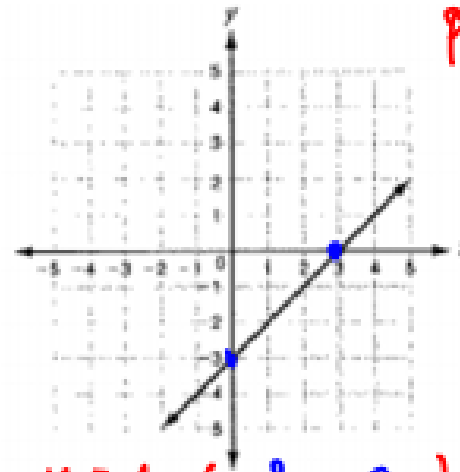
a)

x-int
y-int

X-int :(-2 , 0)
y-int :(0 , 4)

b)

X-int :(-1 , 0)
y-int :(0 , -2)

c)

X-int :(3 , 0)
y-int :(0 , -3)

Ex5) Find the x- and y- intercepts. Then graph the function.

- To find the x-intercept, replace y with 0 and solve for x.
- To find the y-intercept, replace x with 0 and solve for y.
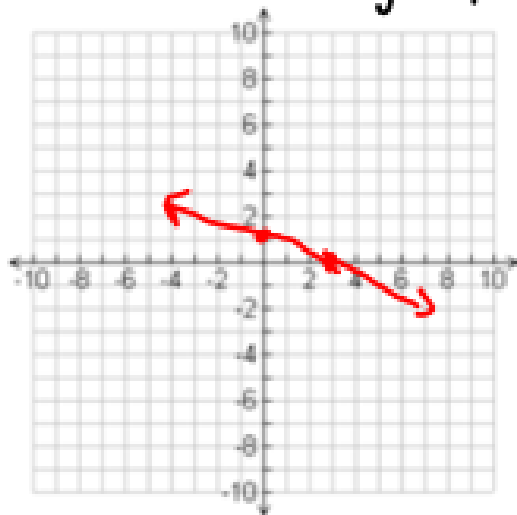
a) $3x + 9y = 9$

X-int: $3x + 9(0) = 9$

$$3x = 9$$
$$x = 3$$

y-int: $3(0) + 9y = 9$

$$9y = 9$$
$$y = 1$$

b) $4x + 6y = -12$

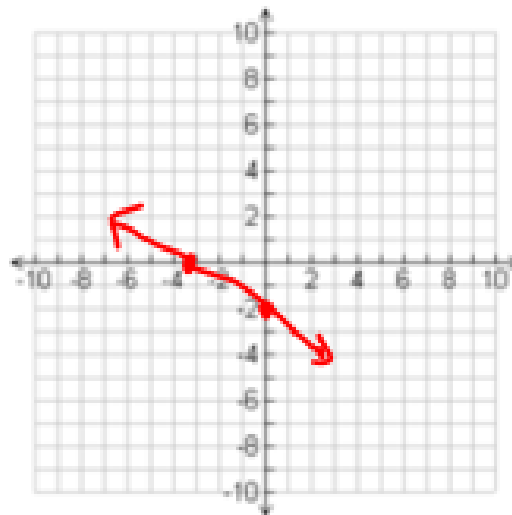X-int: $4x + 6(0) = -12$

$$4x = -12$$
$$x = -3$$

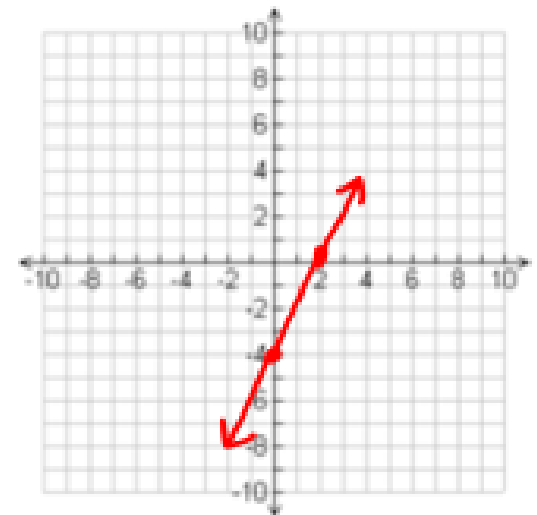y-int: $4(0) + 6y = -12$

$$6y = -12$$
$$y = -2$$

c) $2x - y = 4$

X-int: $2x - 0 = 4$

$$2x = 4$$
$$x = 2$$

y-int: $2(0) - y = 4$

$$y = -4$$

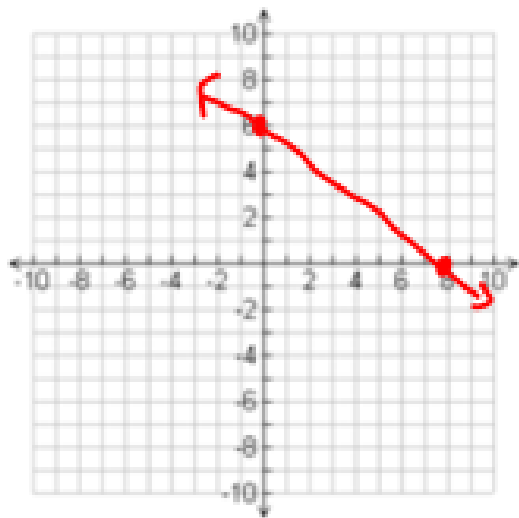$$d\frac{b}{1}\left(\frac{2}{3}y = 4 - \frac{1}{2}x\right)$$

Multiply Everything by the Common denominator.

$$4y = 24 - 3x$$

x-int: $4(0) = 24 - 3x$

$$0 = 24 - 3x$$

$$3x = 24$$

$$x = 8$$

y-int:
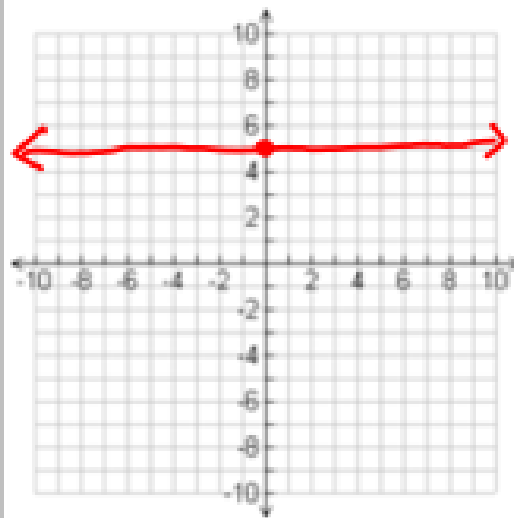
$$4y = 24 - 3(0)$$

$$4y = 24$$

$$y = 6$$

e) $y = 5$

No x-int

y-int: 5

Constant Function

f) $-2y - 5 = 3$

No x-int

$$-2y = 8$$

y-int: $y = -4$

Constant Function