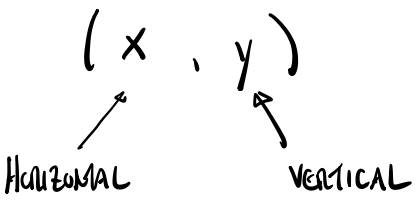
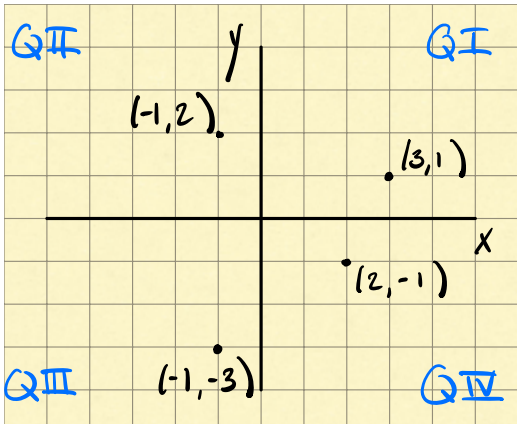
§1.1 Coordinate Plane

1 real # visualized as point on number line

2 real #'s (ordered pair) visualized as point in **coordinate plane**





EXAMPLE 1 ■ Graphing Regions in the Coordinate Plane

Describe and sketch the regions given by each set.

(a) $\{(x, y) \mid x \geq 0\}$ **(b)** $\{(x, y) \mid y = 1\}$ **(c)** $\{(x, y) \mid -1 < y < 1\}$

Q. What is the distance between (2, -4) & (8, 8)?

↓

DISTANCE FORMULA

The distance between the points $A(x_1, y_1)$ and $B(x_2, y_2)$ in the plane is

$$d(A, B) = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

Q. What point is the midpoint of the line segment connecting (-5, 2) & (7, 6)?

↓

MIDPOINT FORMULA

The midpoint of the line segment from $A(x_1, y_1)$ to $B(x_2, y_2)$ is

$$\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$$

§1.2 GRAPHS

THE GRAPH OF AN EQUATION

The **graph** of an equation in x and y is the set of all points (x, y) in the coordinate plane that satisfy the equation.

e.g. WHICH POINTS ARE ON GRAPH OF EQUATION $x^2 + y^2 - 10x + 2y = -17$?

$(5,2)$ ✓ $(0,4)$ ✗

$(8,-1)$ ✓ $(1,-3)$ ✗

↳ MAY NEED TO DO THIS FIRST — STEP 0

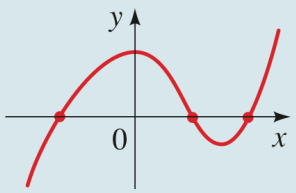
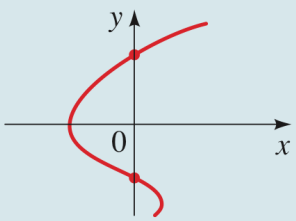
WHEN AN EQUATION IS SOLVED FOR y, IT IS EASY TO SKETCH THE GRAPH OF THE EQUATION BY

- PLUGGING IN VALUES FOR x, — STEP 1
- CALCULATING THE CORRESPONDING y, — STEP 2
- PLOTTING THE POINT. — STEP 3

ex. PLOT 3 POINTS ON GRAPH OF $4x - 2y + 10 = 0$ $(x = -2, 0, 2)$

ex. PLOT 4 POINTS ON GRAPH OF $x^2 - y + 5 = 3x$ $(x = 0, 1, 2, 3)$

DEFINITION OF INTERCEPTS

Intercepts	How to find them	Where they are on the graph
***x*-intercepts:** The x-coordinates of points where the graph of an equation intersects the x-axis	Set $y = 0$ and solve for x	
***y*-intercepts:** The y-coordinates of points where the graph of an equation intersects the y-axis	Set $x = 0$ and solve for y	

ex. Find x & y intercept(s) of

(a) $3x - 2y = 12$

(b) $x^2 + 2xy = y + 3$

(c) $\frac{x^2}{3} + \frac{y^2}{5} = 1$

Equations of Circles

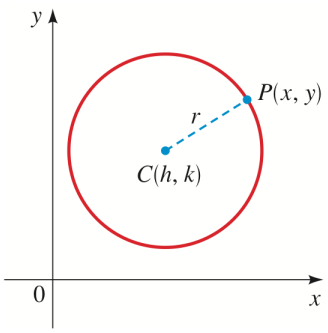
EQUATION OF A CIRCLE

An equation of the circle with center (h, k) and radius r is

$$(x - h)^2 + (y - k)^2 = r^2$$

This is called the **standard form** for the equation of the circle. If the center of the circle is the origin $(0, 0)$, then the equation is

$$x^2 + y^2 = r^2$$



ex. Describe the graph $(x-4)^2 + (y-1)^2 = 6$

ex. Give Eq of circle with center $(-2, 3)$ with radius 4.

(b) Find an equation of the circle that has the points $P(1, 8)$ and $Q(5, -6)$ as the endpoints of a diameter.