

8.1 Apply The Distance & Midpoint Formulas
8.3 Circles



*See printout.

Distance Formula

KEY CONCEPT

For Your Notebook

The Distance Formula

The distance d between (x_1, y_1) and (x_2, y_2) is $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$.

HW Day 1 (new syllabus)

8.1, 8.3 WKST

Midpoint Formula

KEY CONCEPT

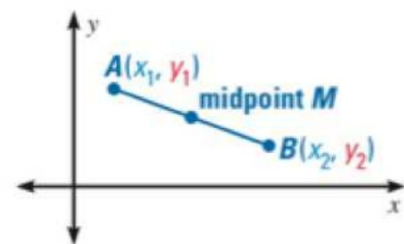
For Your Notebook

The Midpoint Formula

A line segment's *midpoint* is equidistant from the segment's endpoints. The **midpoint formula**, shown below, gives the midpoint of the line segment joining $A(x_1, y_1)$ and $B(x_2, y_2)$.

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

In words, each coordinate of M is the mean of the corresponding coordinates of A and B .



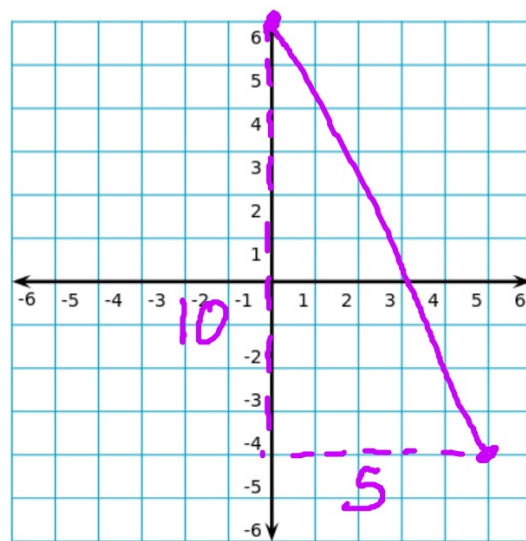
ex: (0, 6), (5, -4)

a) Find the distance between the two points.

$$d = \sqrt{5^2 + 10^2}$$
$$= \sqrt{25 + 100} = 5\sqrt{5}$$

b) Find the midpoint of the line segment joining the two points.

$$\left(\frac{0+5}{2}, \frac{6-4}{2} \right) \Rightarrow \left(\frac{5}{2}, 1 \right)$$



$$10^2 + 5^2 = c^2$$

$$5\sqrt{5} = c$$

Conic Sections

conic section - a figure formed by the intersection of a plane and a double-napped cone.



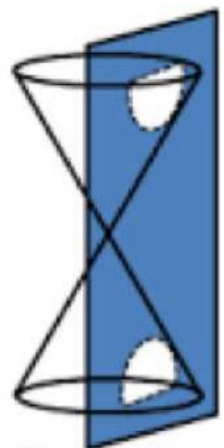
Parabola



Circle



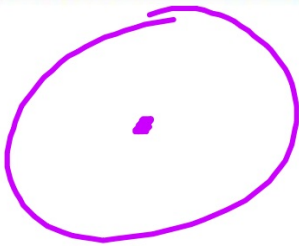
Ellipse



Hyperbola

circle - locus of points equidistant from a center
(set)

Standard Form



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

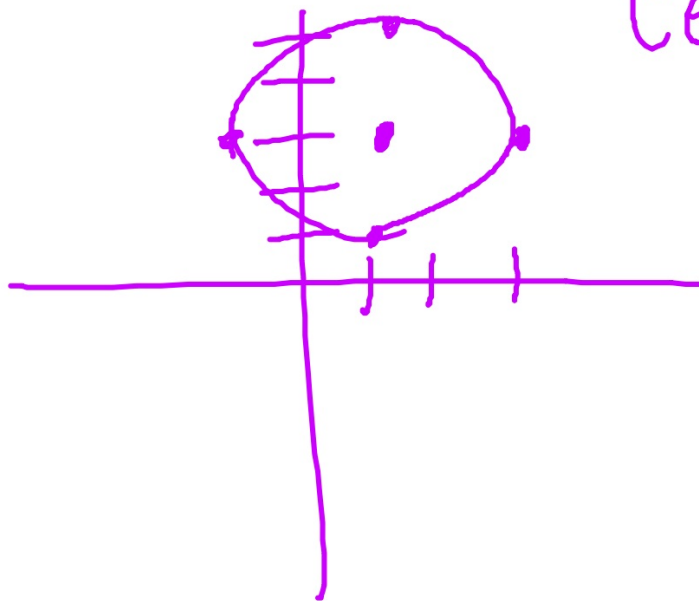
Where:

(h, k): center

r: radius

ex: Sketch. Then state the center and radius.

a) $(x-1)^2 + (y-3)^2 = 4$

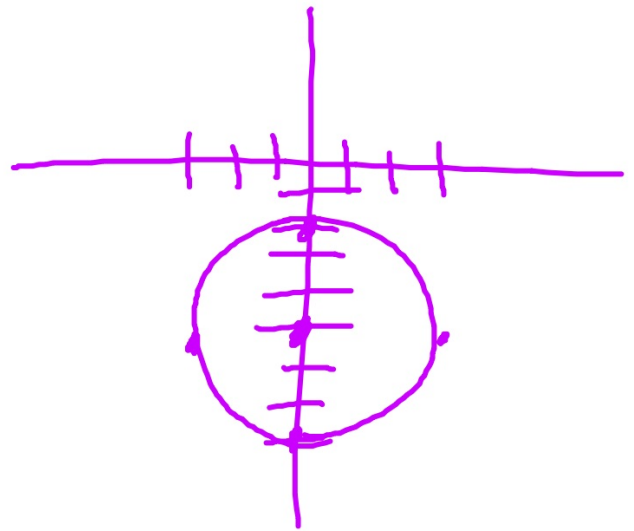


Center $(1, 3)$
 $r = 2$

ex: Sketch. Then state the center and radius.

$$b) x^2 + (y+5)^2 = 9$$

Center $(0, -5)$
 $r = 3$



REVIEW

ex: Complete the square.

a) $x^2 - 8x + 13$

$$\left(\frac{-8}{2}\right)^2 = 16$$

$$(x^2 - 8x + 16) - 16 + 13$$

$$(x-4)^2 - 3$$

b) $x^2 + 10x - 1$

ex: Complete the square.

c) $2x^2 - 12x - 7$

d) $-3x^2 + 12x + 5$

ex: Rewrite from general to standard form. Then sketch and state the center and radius.

a) $x^2 + y^2 + 2x - 6y + 5 = 0$

$$\underbrace{x^2 + 2x + 1}_{\text{}} - 1 + y^2 - 6y + 9 - 9 = -5$$

$$(x+1)^2 - 1 + (y-3)^2 - 9 = -5$$

$$(x+1)^2 + (y-3)^2 = 5$$

ex: Rewrite from general to standard form. Then sketch and state the center and radius.

b) $x^2 + y^2 + 6x - 4y + 12 = 0$

$$x^2 + 6x + 9 - 9 + y^2 - 4y + 4 - 4 = -12$$

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

$$C: (-3, 2)$$
$$r = 1$$

ex: Write an equation in standard form of the circle with the given characteristics.

a)

center: (6, 4)

Area: 9π

$$(x-6)^2 + (y-4)^2 = 9$$

$$9\pi = \pi r^2$$

$$9 = r^2$$

ex: Write an equation in standard form of the circle with the given characteristics.

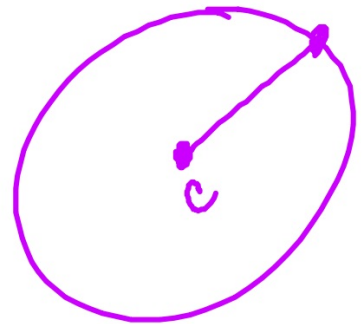
b)

Endpoints of a diameter: $(-7, -1), (-9, 5)$

Center: $(-8, 2)$

$$(x+8)^2 + (y-2)^2 = 10$$

$$\begin{aligned} d &= \sqrt{4+36} \\ &= \sqrt{40} \\ &= 2\sqrt{10} \\ r &= \sqrt{10} \end{aligned}$$



ex: Write an equation in standard form of the circle with the given characteristics.

c)

Center: (4, 3)

Lies tangent to the line $y=6$

$$(x-4)^2 + (y-3)^2 = 9$$

