

# Ch 9.3 – Ellipses

# DAY 4

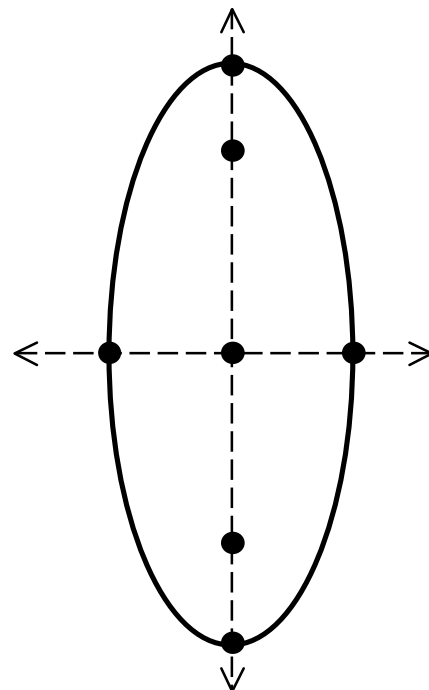
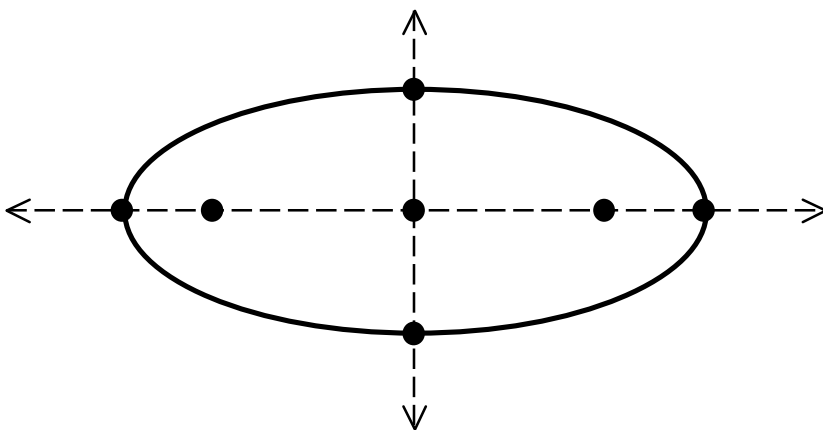
**Ellipse:** the **set of points** in a plane, the sum of whose distances from two fixed points, called **foci**, is a constant.

Important components of the ellipse:

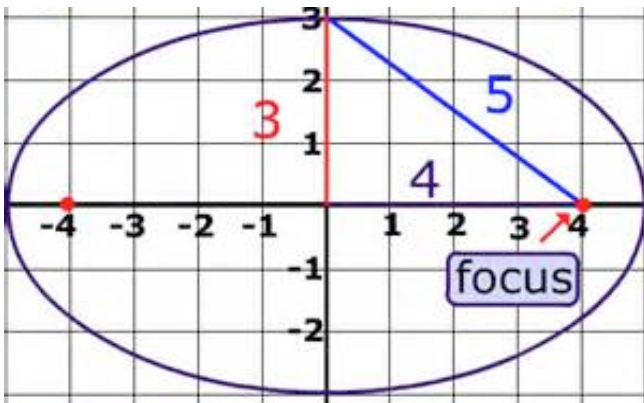
- The line containing the foci is the **major axis**.
- The midpoint of the segment containing the foci is the **center** of the ellipse.
- The line through the center, perpendicular to the major axis, is the **minor axis**.
- The two points of intersection of the ellipse and the major axis are the **vertices** of the ellipse.

**Equation of an ellipse with center at the origin:**

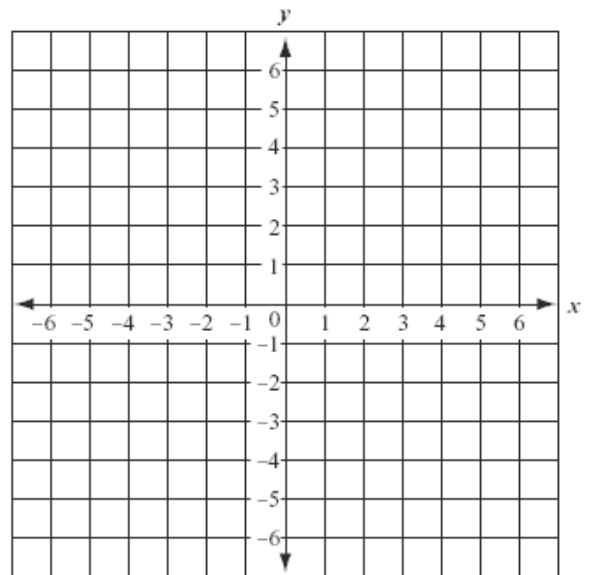
Major Axis	Foci	Vertices	Equation
x-axis	$(-c, 0)$ and $(c, 0)$	$(-a, 0)$ and $(a, 0)$	$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ $a > b > 0$ and $b^2 = a^2 - c^2$
y-axis	$(0, -c)$ and $(0, c)$	$(0, -a)$ and $(0, a)$	$\frac{x^2}{b^2} + \frac{y^2}{a^2} = 1$ $a > b > 0$ and $b^2 = a^2 - c^2$



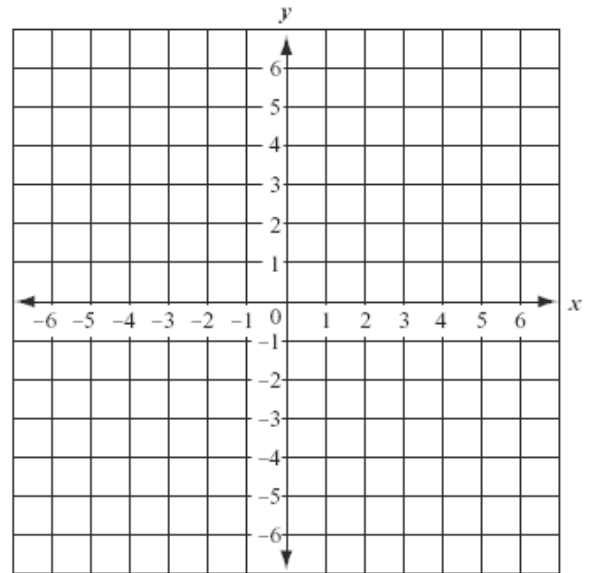
Identify the important components....



Example 1: Graph  $\frac{(x-3)^2}{4} + \frac{(y+1)^2}{9} = 1$



Example 2: Graph  $\frac{(x+4)^2}{9} + \frac{(y+2)^2}{4} = 1$



Example 3: Write the equation in standard form:  $4x^2 + y^2 - 8x + 4y + 4 = 0$

Example 4: Find the equation of the ellipse if the center is  $(0, 0)$ , a focus is  $(3, 0)$ , and a vertex is  $(5, 0)$ .

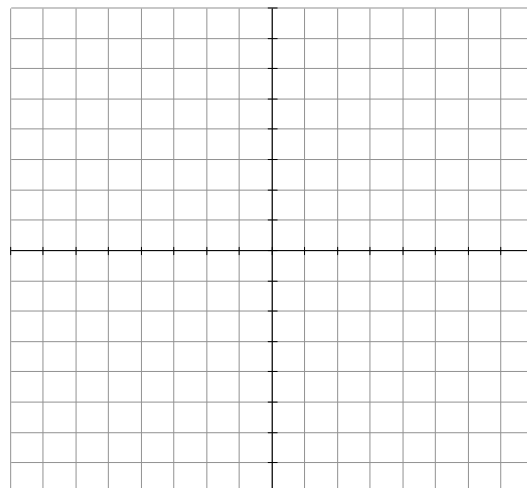
Example 5: Find the equation of the ellipse if the foci are  $(0, \pm 3)$  and the x-intercepts are 5 and 13.



# Ellipse Practice

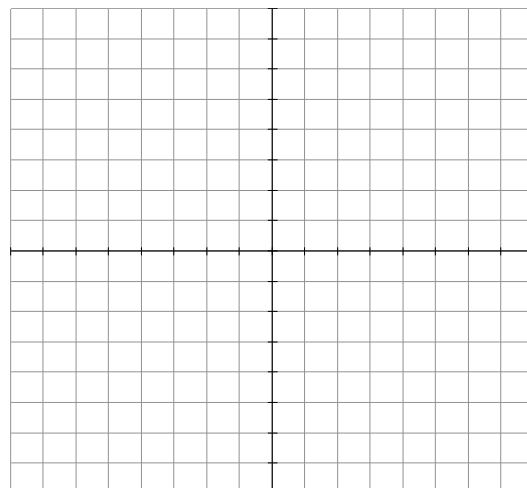
Point-slope form: \_\_\_\_\_

1. Find the ordered pair 5 units above  $(3, -2)$
2. Find the ordered pair  $\sqrt{6}$  units to the left of  $(3, -2)$
3. Write and graph the equation of the line in point-slope form that has a slope =  $\frac{1}{2}$  and passes through the point  $(-4, 6)$ .



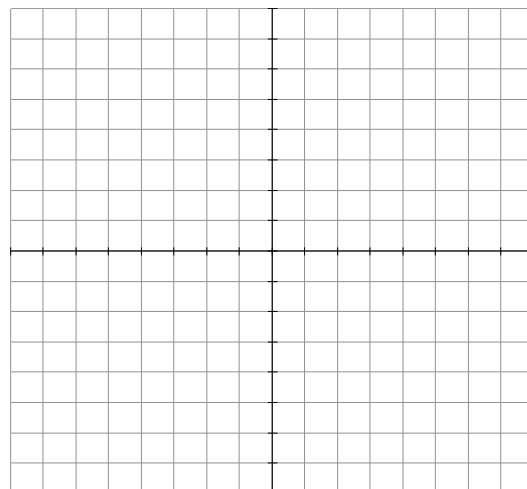
4. Find the center, radius, intercepts and sketch the graph of:

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



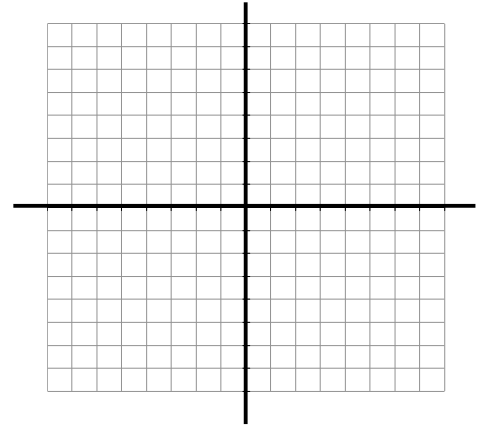
6. Discuss the ellipse and sketch its graph:

$$\frac{(x-3)^2}{4} + \frac{(y+2)^2}{25} = 1$$



7. Discuss the ellipse and sketch the graph.

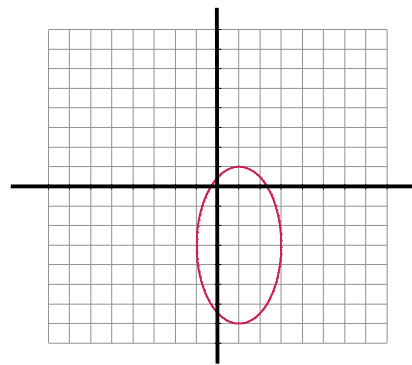
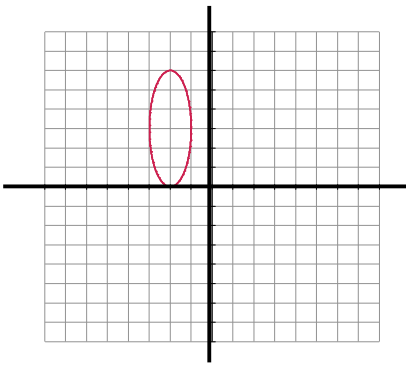
$$2(x+4)^2 + 9(y+2)^2 = 18$$



8. Determine the equation of the ellipse shown in the graphs.

A.) \_\_\_\_\_

B.) \_\_\_\_\_



9. Determine the equation of the ellipse with center at  $(0, 0)$ , focus at  $(-1, 0)$ , and vertex at  $(3, 0)$ .

10. Determine the equation of the ellipse with foci at  $(0, \pm 2)$  and length of major axis = 8.