

#10 Pre-Calculus Worksheet

Name: Key

Period:     

Conic Sections - Ellipses & Hyperbolas

Find the requested information for each Graph COMPLETELY.

1.  $\frac{x^2}{36} + \frac{y^2}{16} = 1$  Ellipse

$c^2 = 36 - 16$   
 $c^2 = 20$   
 $c = 2\sqrt{5}$

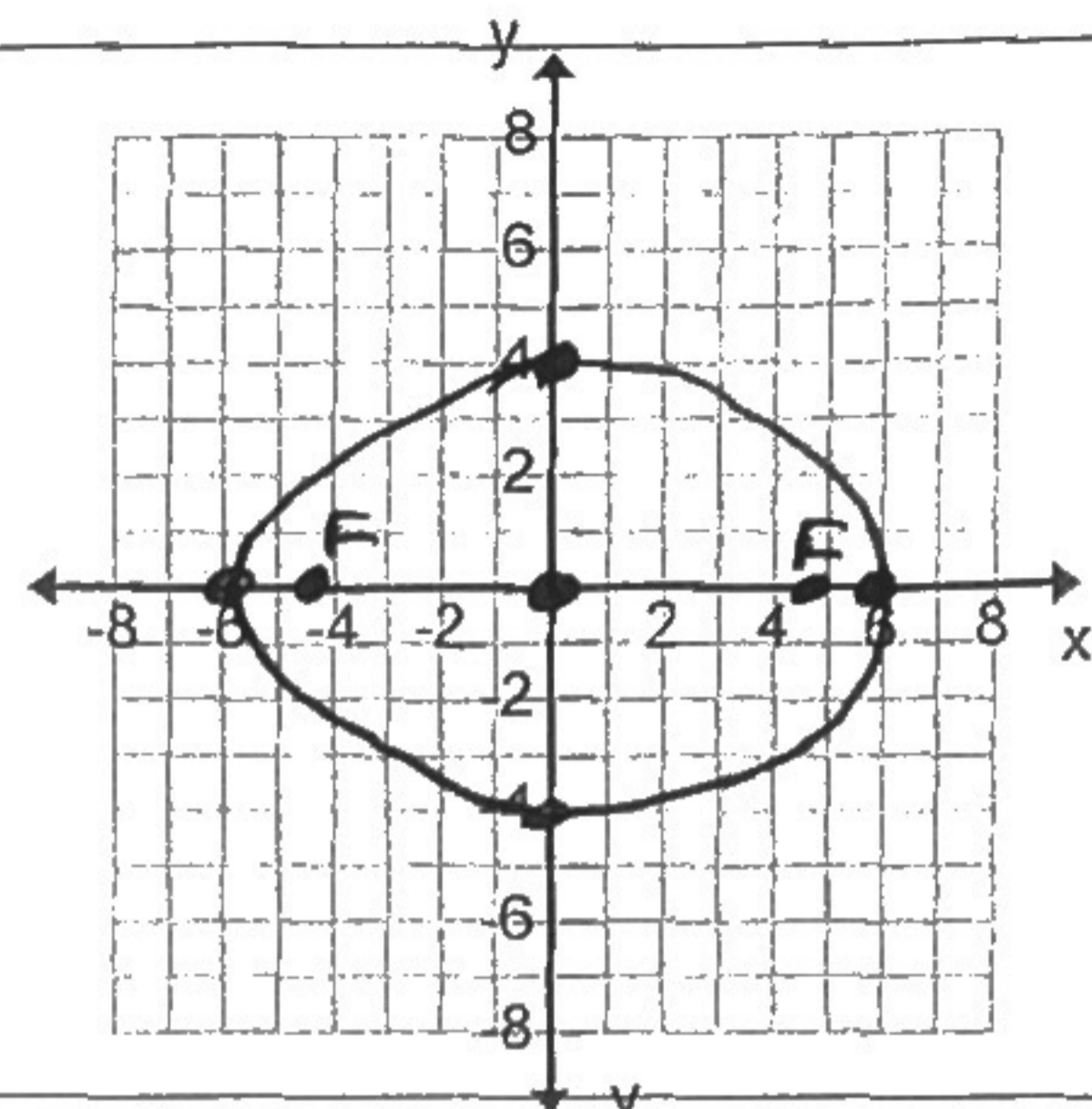
Center: (0, 0)

Major Axis Endpoints: (-6, 0) and (6, 0)

Minor Axis Endpoints: (0, 4) and (0, -4)

Foci: (-2√5, 0) and (2√5, 0)

Eccentricity  $\approx \frac{\sqrt{20}}{6} \approx .745$



2.  $\frac{(x-2)^2}{16} + \frac{(y-3)^2}{9} = 1$

$c^2 = 16 - 9$   
 $c^2 = 7$   
 $c = \sqrt{7}$

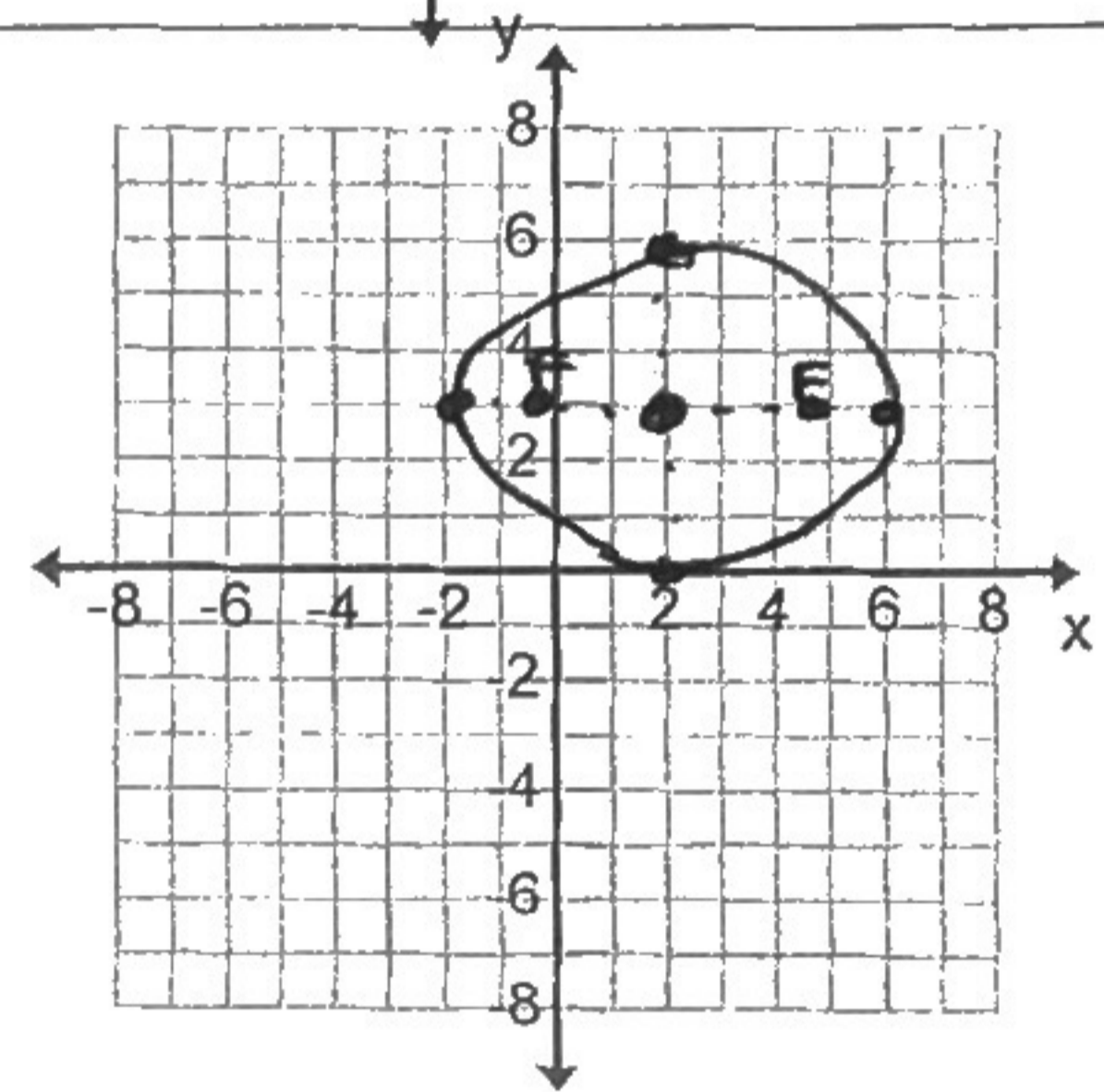
Center: (2, 3)

Major Axis Endpoints: (-2, 3) and (6, 3)

Minor Axis Endpoints: (2, 0) and (2, 6)

Foci: (2-√7, 3) and (2+√7, 3)

Eccentricity  $\approx \frac{\sqrt{7}}{4} \approx .666$



3.  $x^2 + 9y^2 + 4x + 18y + 4 = 0$

$(x^2 + 4x + \underline{\quad}) + 9(y^2 + 2y + \underline{\quad}) = -4 + \underline{\quad} + \underline{\quad}$   
 $(x^2 + 4x + 2^2) + 9(y^2 + 2y + 1^2) = -4 + 4 + 9$   
 $(x+2)^2 + 9(y+1)^2 = 9$

Center: (-2, -1)

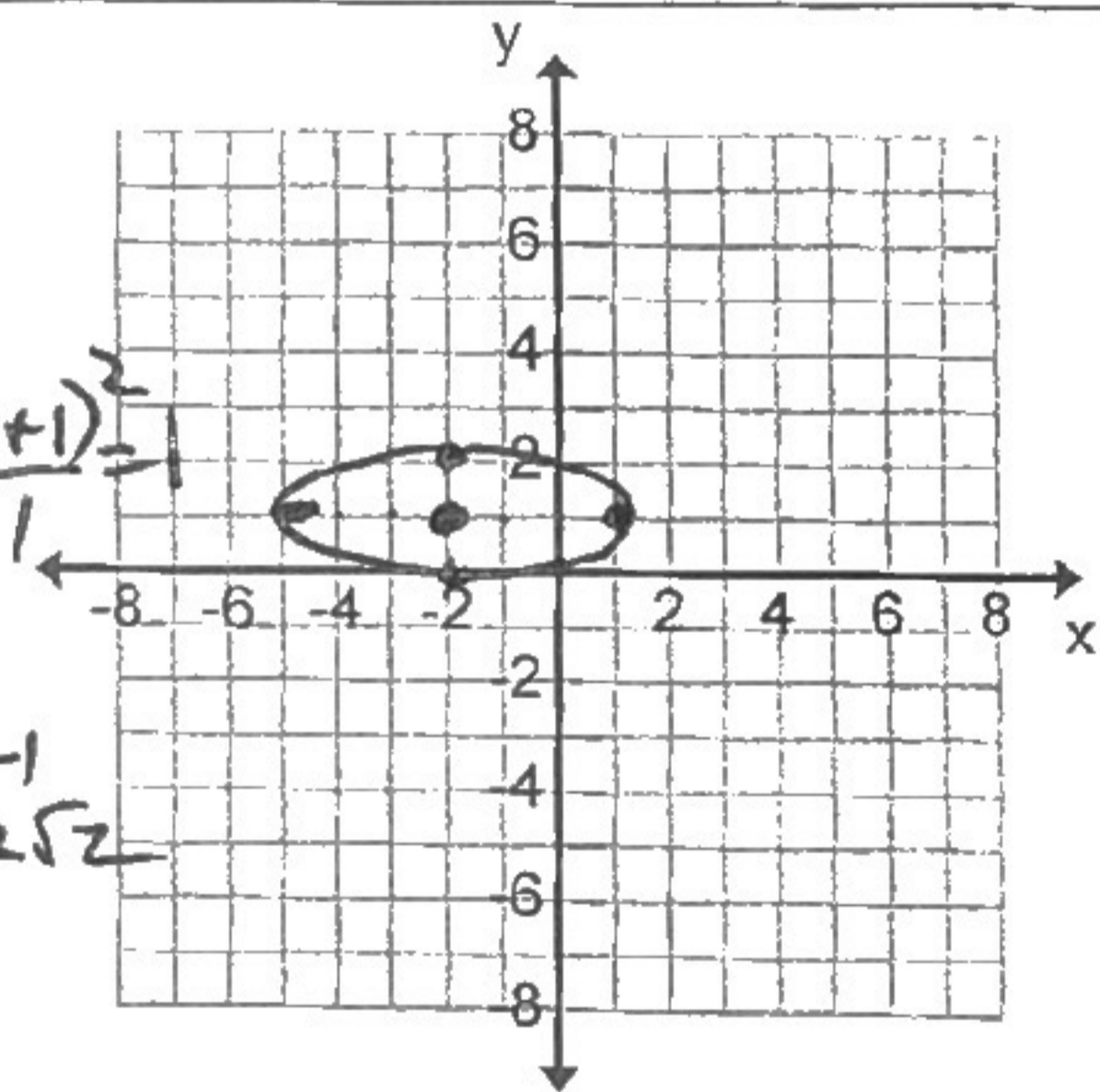
Major Axis Endpoints: (-5, -1) and (1, -1)

Minor Axis Endpoints: (-2, 0) and (-2, -2)

Foci: (-2-2√2, -1) and (-2+2√2, -1)

Eccentricity  $\approx \frac{\sqrt{8}}{3} \approx .94$

$\frac{(x+2)^2}{9} + \frac{(y+1)^2}{1} = 1$   
 $c^2 = 9 - 1$   
 $c = 2\sqrt{2}$



4.  $\frac{y^2}{49} - \frac{x^2}{25} = 1$

$c^2 = 49 + 25$   
 $c = \sqrt{74}$

Center: (0, 0)

Transverse Axis Endpoints: (0, 7) and (0, -7)

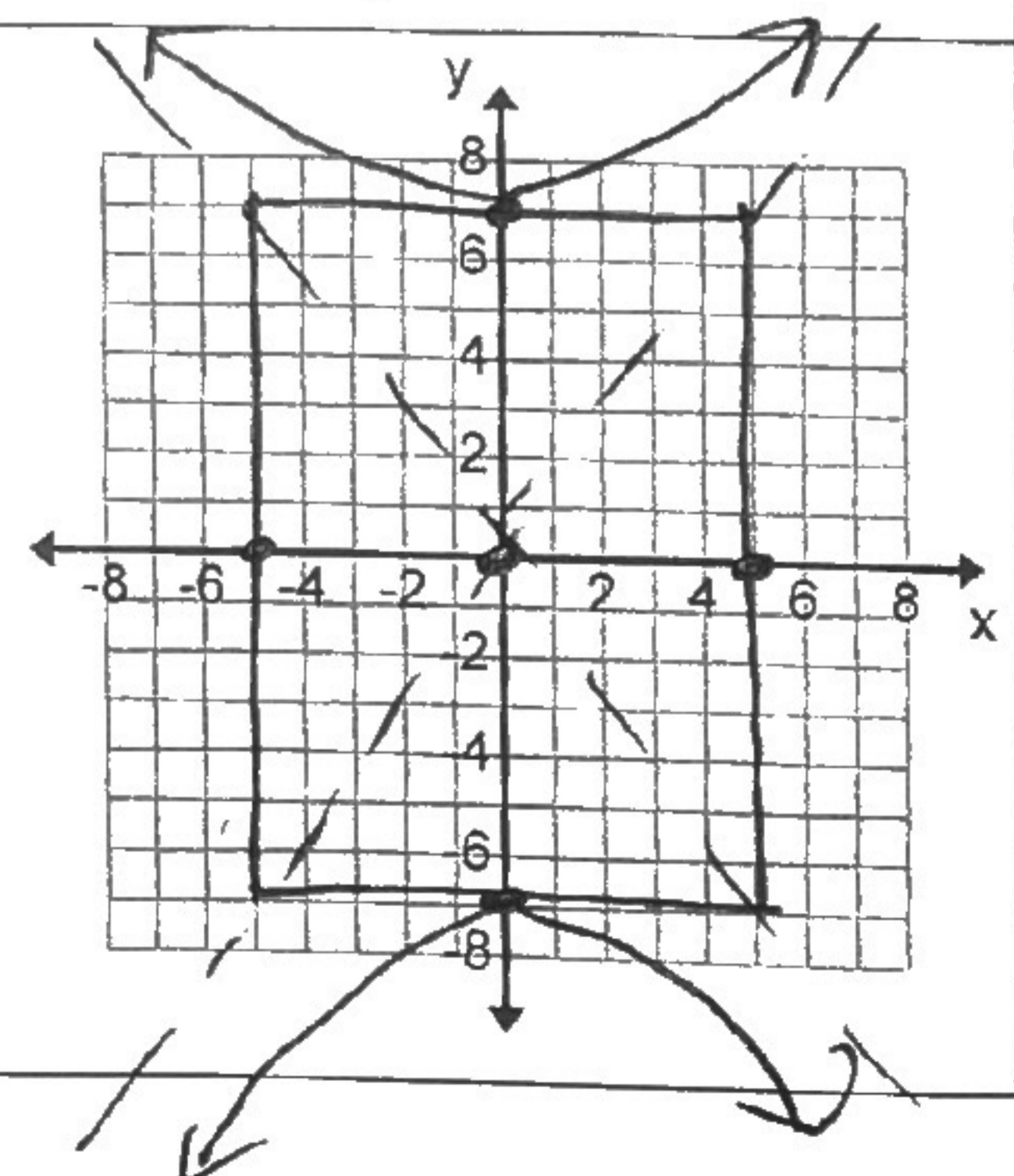
Conjugate Axis Endpoints: (-5, 0) and (5, 0)

Foci: (0, -√74) and (0, √74)

Eccentricity  $\approx \frac{\sqrt{74}}{7} \approx 1.22$

Equations of Asymptotes:  $y = \pm \frac{7}{5}x$

$m = \pm \frac{7}{5}$



5.  $9x^2 - 16y^2 - 54x - 64y - 127 = 0$   $(9x^2 - 54x + \dots) + (-16y^2 - 64y + \dots) = 127 + \dots$   
 $9(x^2 - 6x + 9) + (-16(y^2 + 4y + 4)) = 127 + 81 + (-64)$   
 $9(x-3)^2 - 16(y+2)^2 = 127 + 81 - 64$   
 $\frac{(x-3)^2}{16} - \frac{(y+2)^2}{9} = 1$

Center:  $(3, -2)$

Transverse Axis Endpoints:  $(-1, -2)$  and  $(7, -2)$

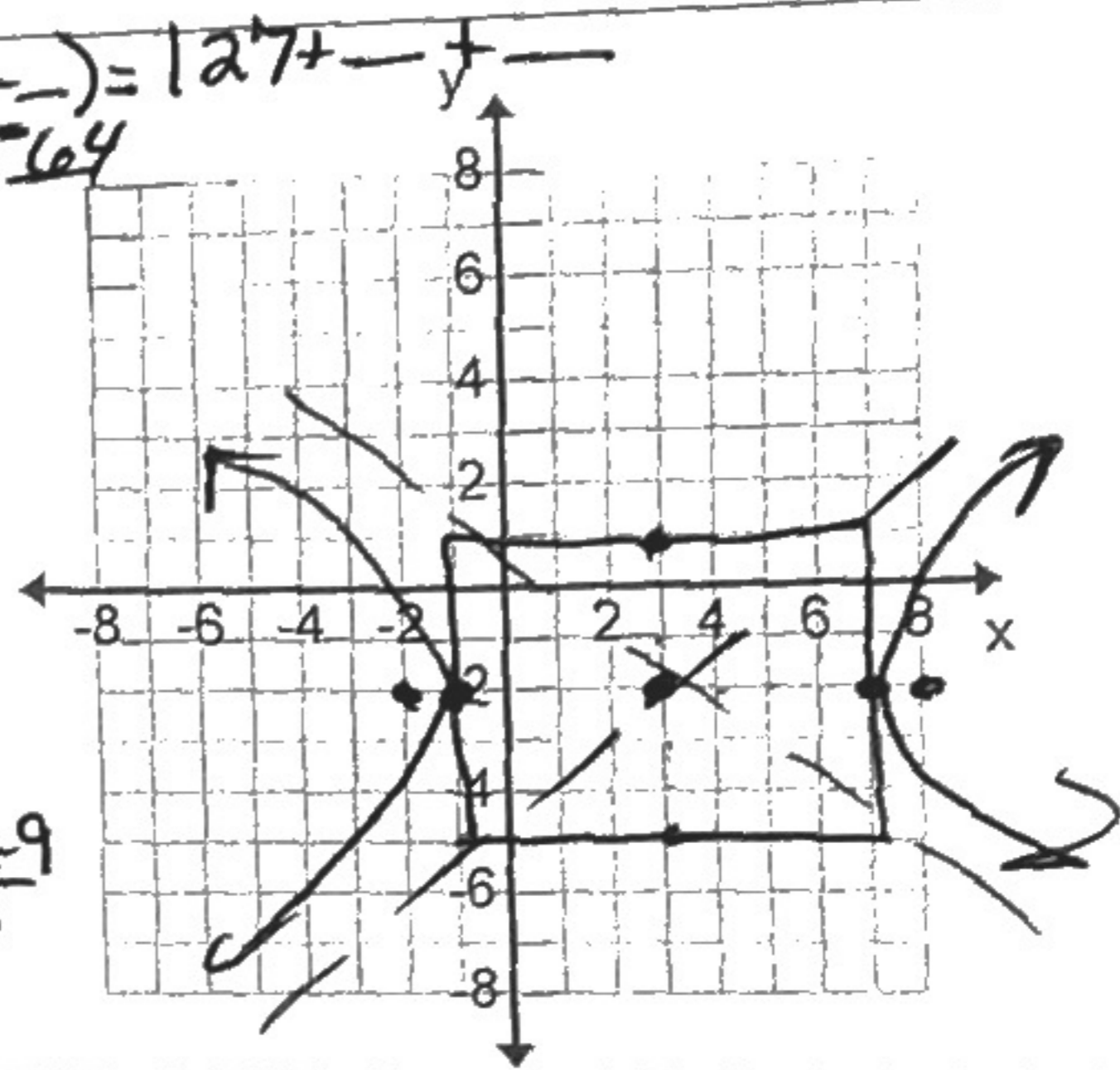
Conjugate Axis Endpoints:  $(3, -5)$  and  $(3, 1)$

Foci:  $(-2, -2)$  and  $(8, -2)$

Eccentricity  $\approx \frac{5}{4} = 1.25$

Equations of Asymptotes:  $y + 2 = \pm \frac{3}{4}(x - 3)$

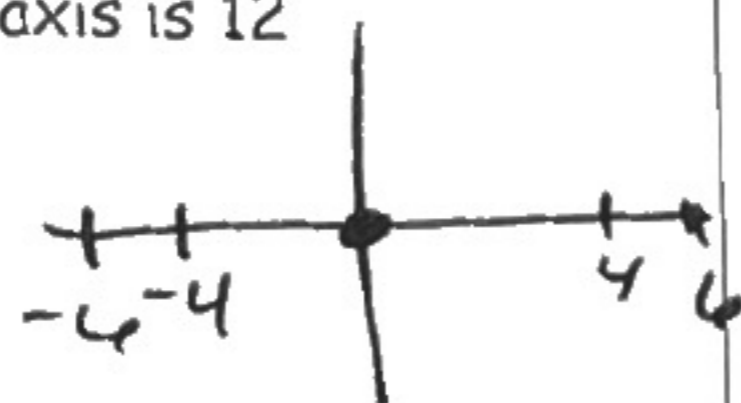
$f^2 = 16 + 9$   
 $f = 5$



Write the equation of each ellipse or hyperbola in the standard form.

6. Foci  $(\pm 4, 0)$ ; length of the major axis is 12

$\frac{x^2}{36} + \frac{y^2}{20} = 1$



$16 = 36 - b^2$   
 $-20 = -b^2$   
 $20 = b^2$

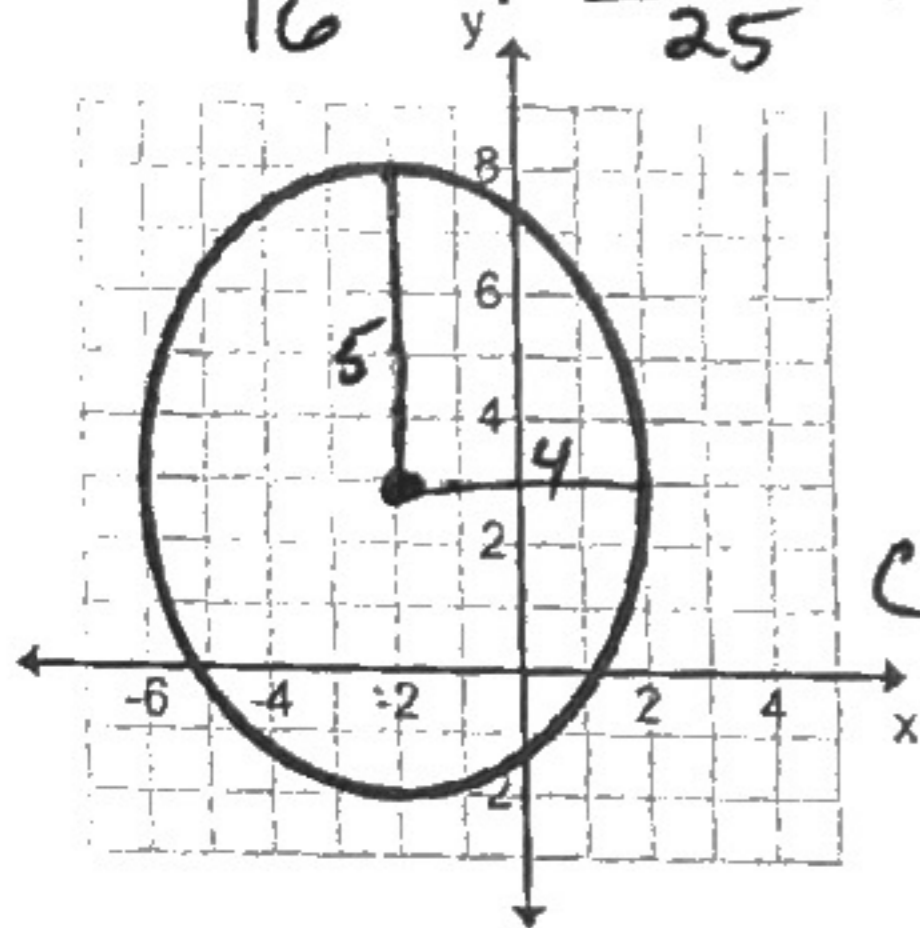
7. Foci  $(2, 5)$  and  $(2, 1)$ ; Sum of the focal radii is  $2\sqrt{13}$

$\frac{(x-2)^2}{9} + \frac{(y-3)^2}{13} = 1$



$4^2 = 13 - b^2$   $-9 = b^2$   $b^2 = 9$   $C(2, 3)$

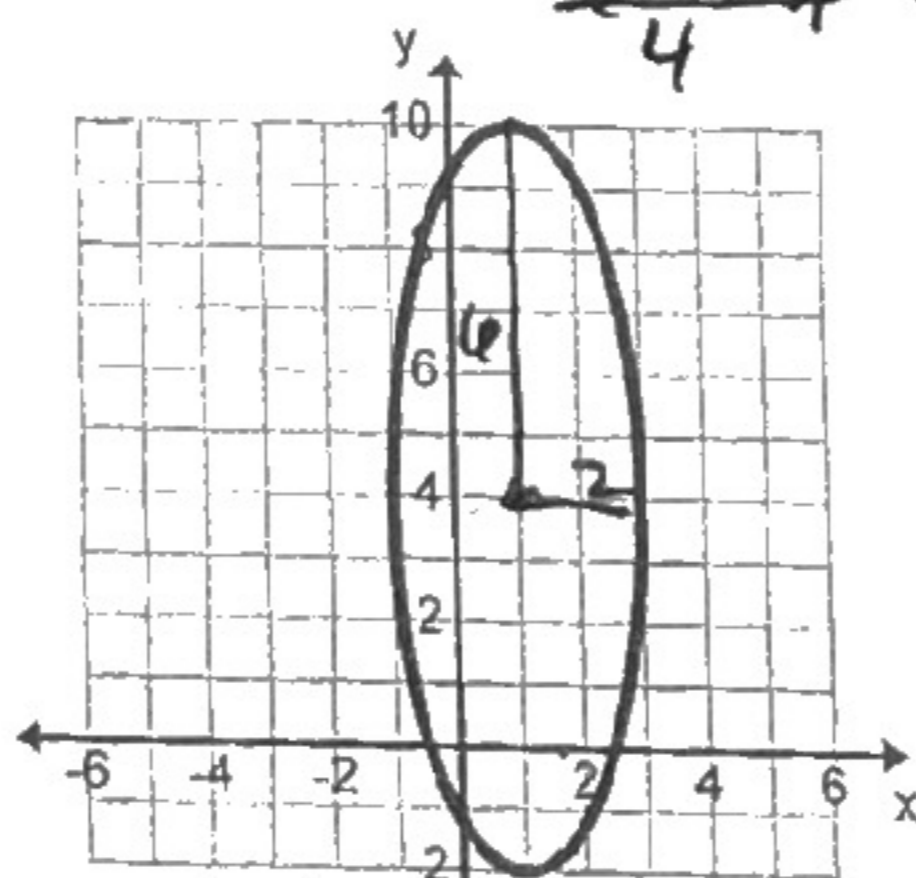
8.  $\frac{(x+2)^2}{16} + \frac{(y-3)^2}{25} = 1$



$C(-2, 3)$

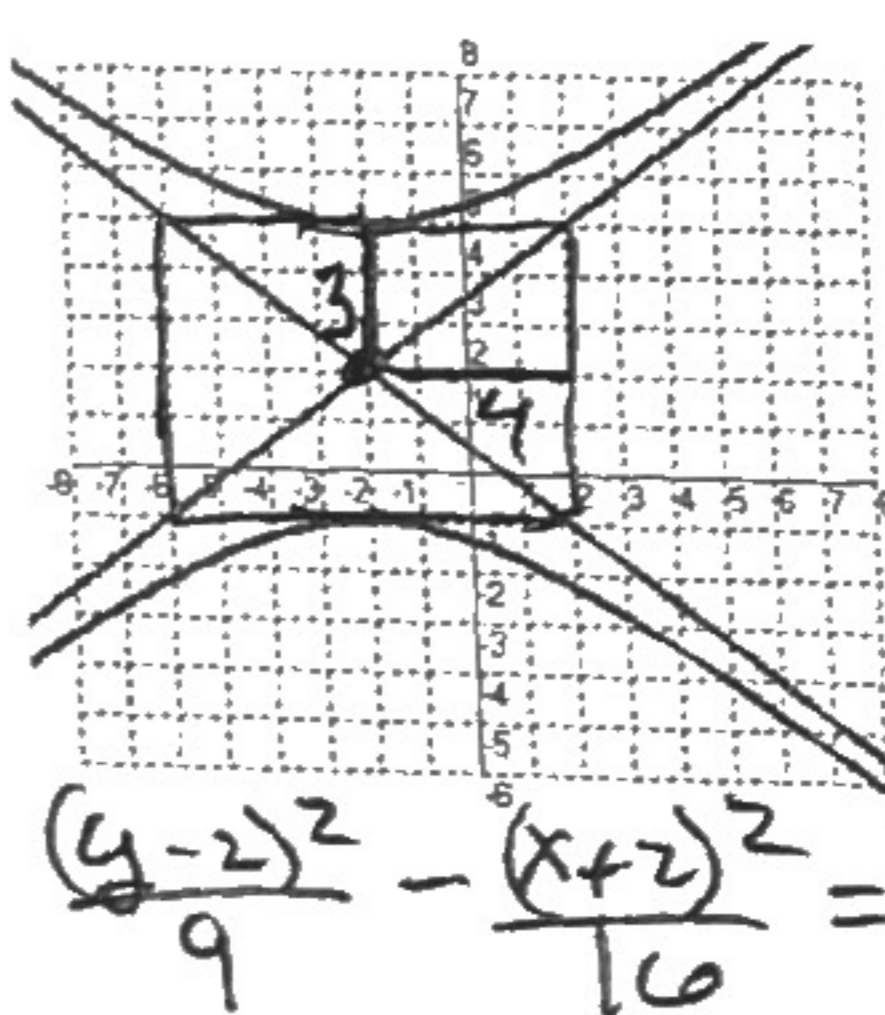
9.

$\frac{(x-1)^2}{4} + \frac{(y-4)^2}{36} = 1$



$C(1, 4)$

10.



$C(-2, 2)$

$\frac{(y-2)^2}{9} - \frac{(x+2)^2}{16} = 1$

Remember Circles?

11. Write the equation of a circle in standard form that has a center of  $(-3, 4)$  and passes through the point  $(5, -2)$ .

$(5-3)^2 + (-2-4)^2 = r^2$   
 $4 + 36 = r^2$   
 $40 = r^2$

$(x+3)^2 + (y-4)^2 = 40$

12. Write the equation in Standard form of an ellipse with foci  $(4, \pm\sqrt{7})$  if the length of the minor axis is 6.

$\frac{(x-4)^2}{9} + \frac{y^2}{16} = 1$

$r^2 = a^2 = 9$   
 $16 = a^2$

$C(4, 0)$

13. Identify each of the following as a circle, a point circle, or an empty set. Provide work to justify your answer.

point (a)  $x^2 + y^2 - 6x + 4y + 13 = 0$

circle (b)  $x^2 + y^2 + 10x + 16 = 0$

empty set (c)  $x^2 + y^2 + 4x - 10y + 30 = 0$