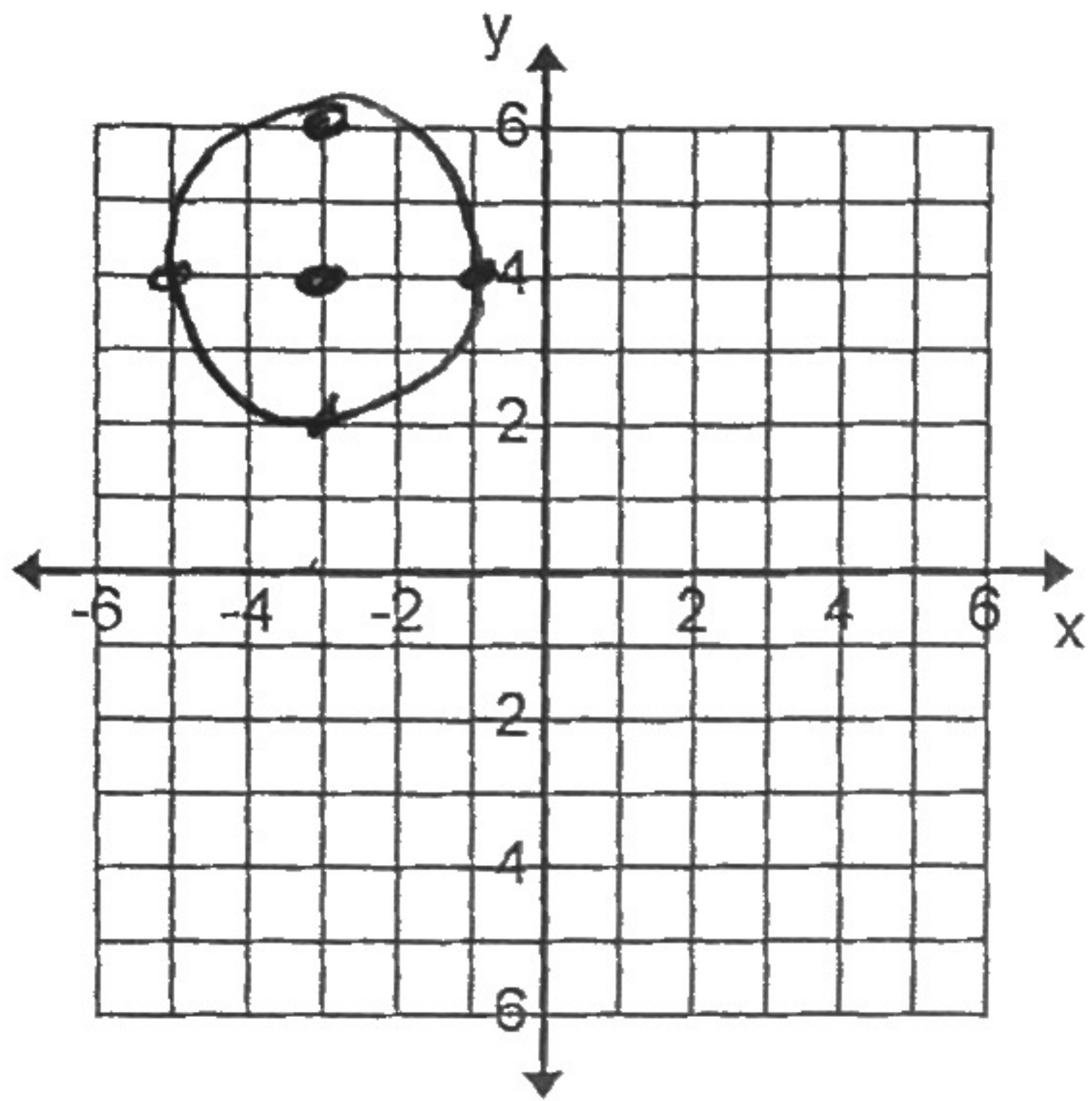


Graph the following and identify the characteristics.

1.  $x^2 + y^2 + 6x - 8y + 21 = 0$

$$(x^2 + 6x + 9) + (y^2 - 8y + 16) = -21 + 9 + 16$$

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



Center:  
 $(-3, 4)$   
Radius:  
2

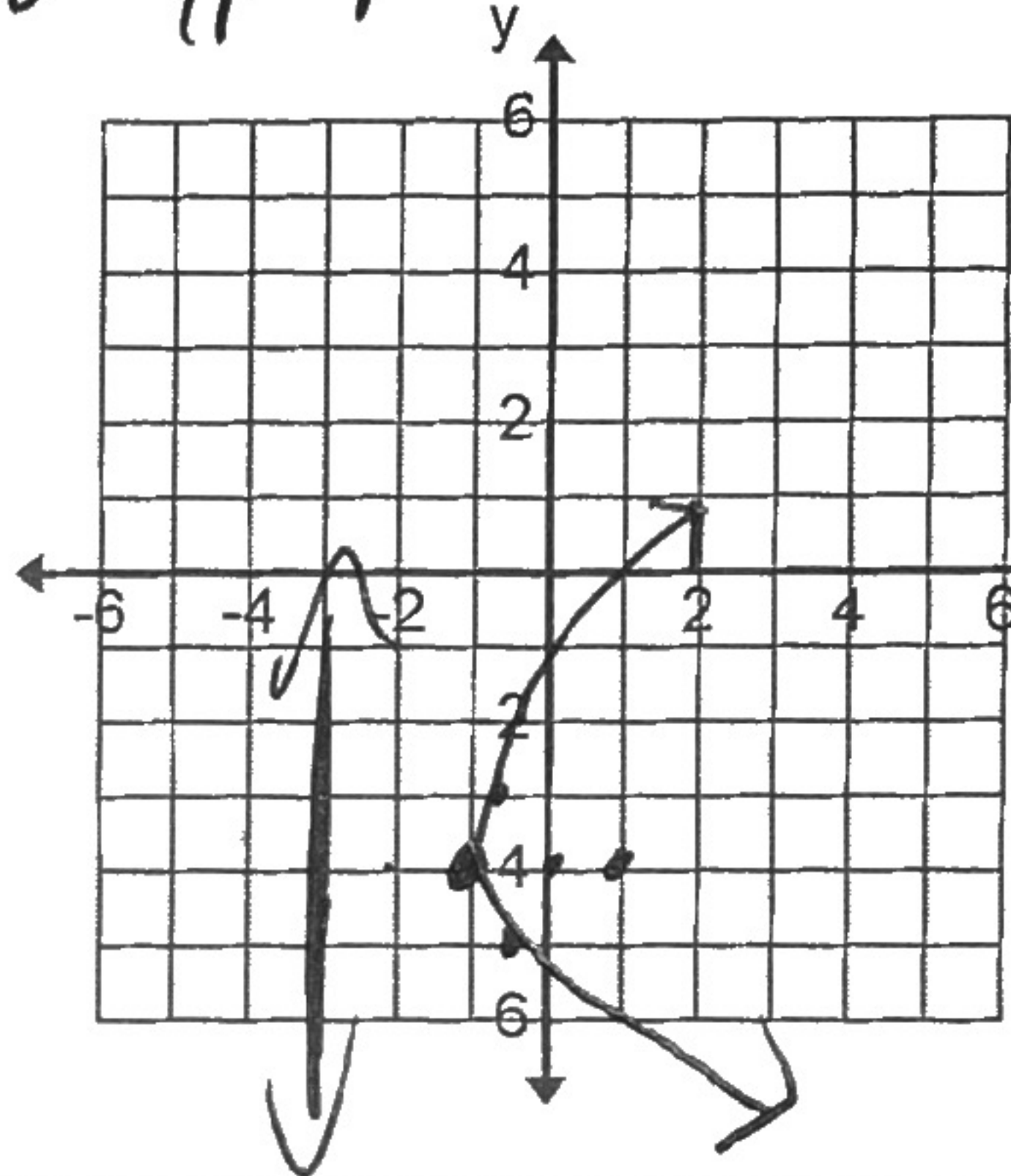
2.  $y^2 - 8x + 8y + 8 = 0$

$$(y^2 + 8y + 16) + 8 - 16 = 8x$$

$$\frac{(y+4)^2 - 8}{8} = \frac{8x}{8}$$

$$\frac{1}{8}(y+4)^2 - 1 = x$$

$$\frac{1}{8} = \frac{1}{4p} \quad p = 2$$



Vertex:  
 $(-1, -4)$   
Focus:  
 $(1, -4)$   
Directrix:  
 $x = -3$   
Axis of Symmetry:  
 $y = -4$

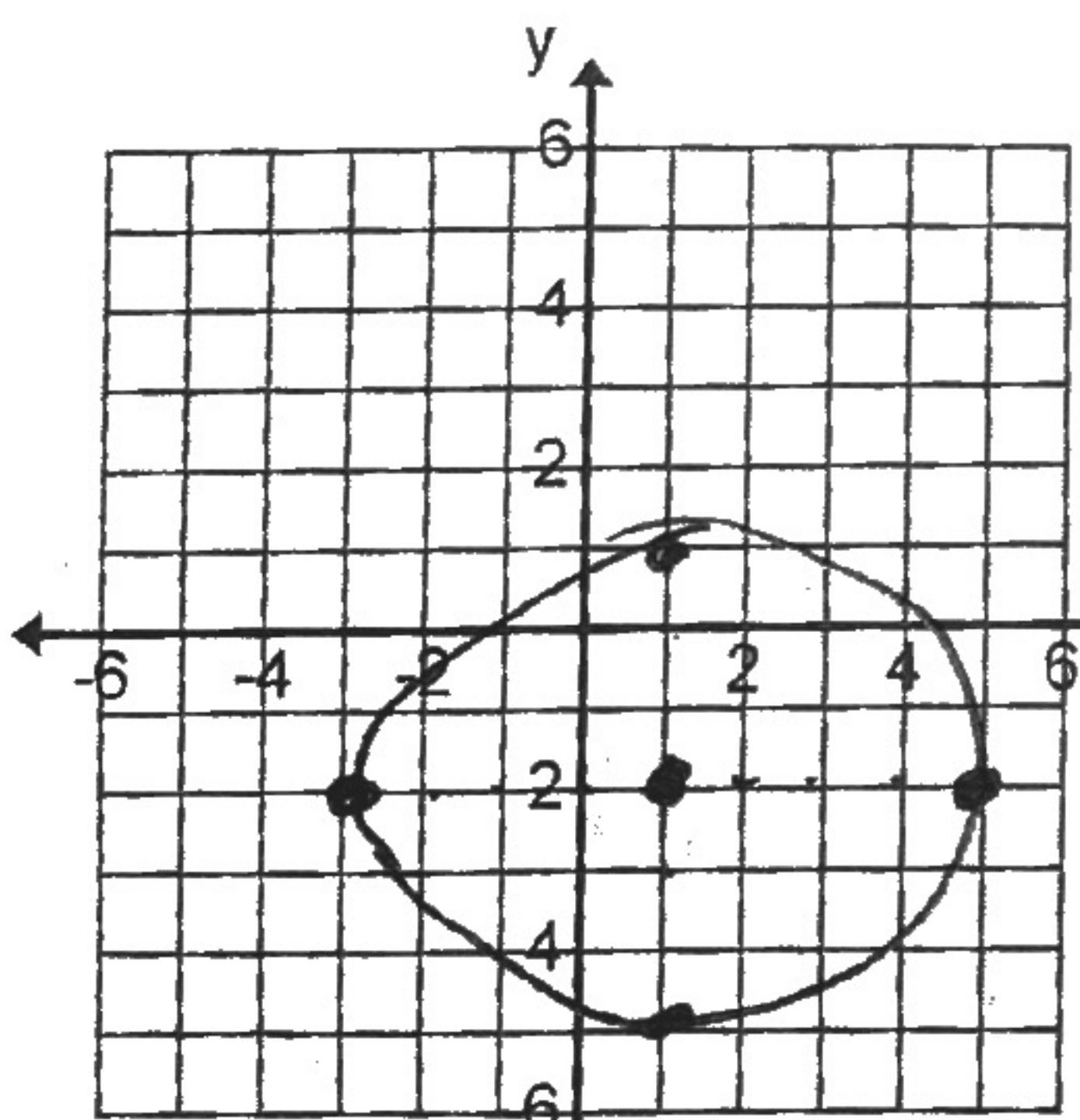
3.  $9x^2 + 16y^2 - 18x + 64y - 71 = 0$

$$(9x^2 - 18x + \dots) + (16y^2 + 64y + \dots) = 71 + \dots$$

$$9(x^2 - 2x + 1) + 16(y^2 + 4y + 4) = 71 + 9 + 64$$

$$9(x-1)^2 + 16(y+2)^2 = 144$$

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



Center:  
 $(1, -2)$   
End Pts Major Axis:  
 $(-3, -2)$   $(5, -2)$   
End Pts Minor Axis:  
 $(1, 1)$   $(1, -5)$   
Focus:  
 $(1 \pm \sqrt{7}, -2)$   
Eccentricity:  
0.661

$$f^2 = 16 - 9$$

$$f = \sqrt{7}$$

$$e = \frac{\sqrt{7}}{4}$$

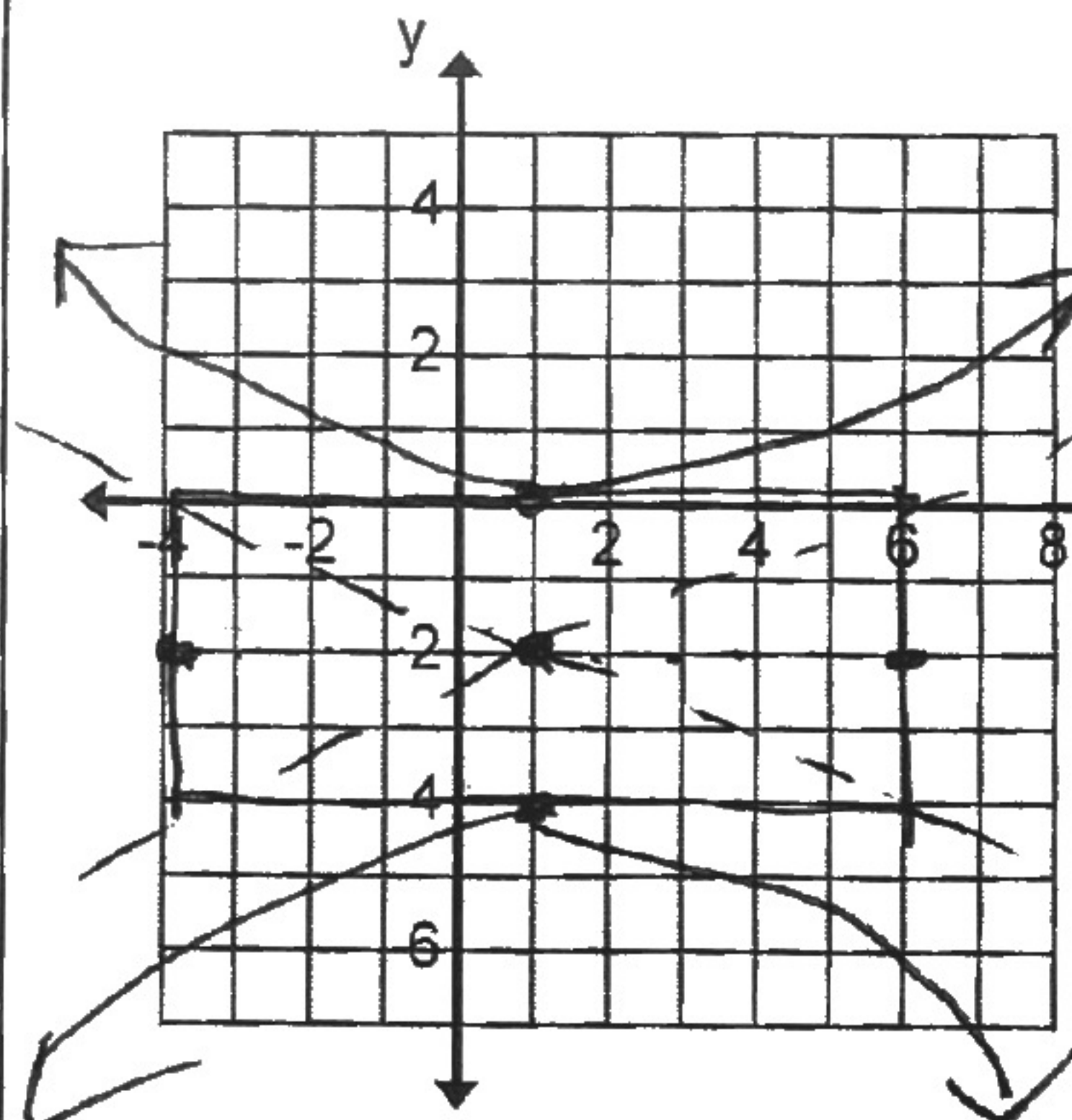
4.  $4x^2 - 25y^2 - 8x - 200y - 296 = 0$

$$(4x^2 - 8x + \dots) + (-25y^2 - 200y + \dots) = 296 + \dots$$

$$4(x^2 - 2x + 1) - 25(y^2 + 8y + 16) = 296 + 4 - 400$$

$$4(x-1)^2 - 25(y+2)^2 = -100$$

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



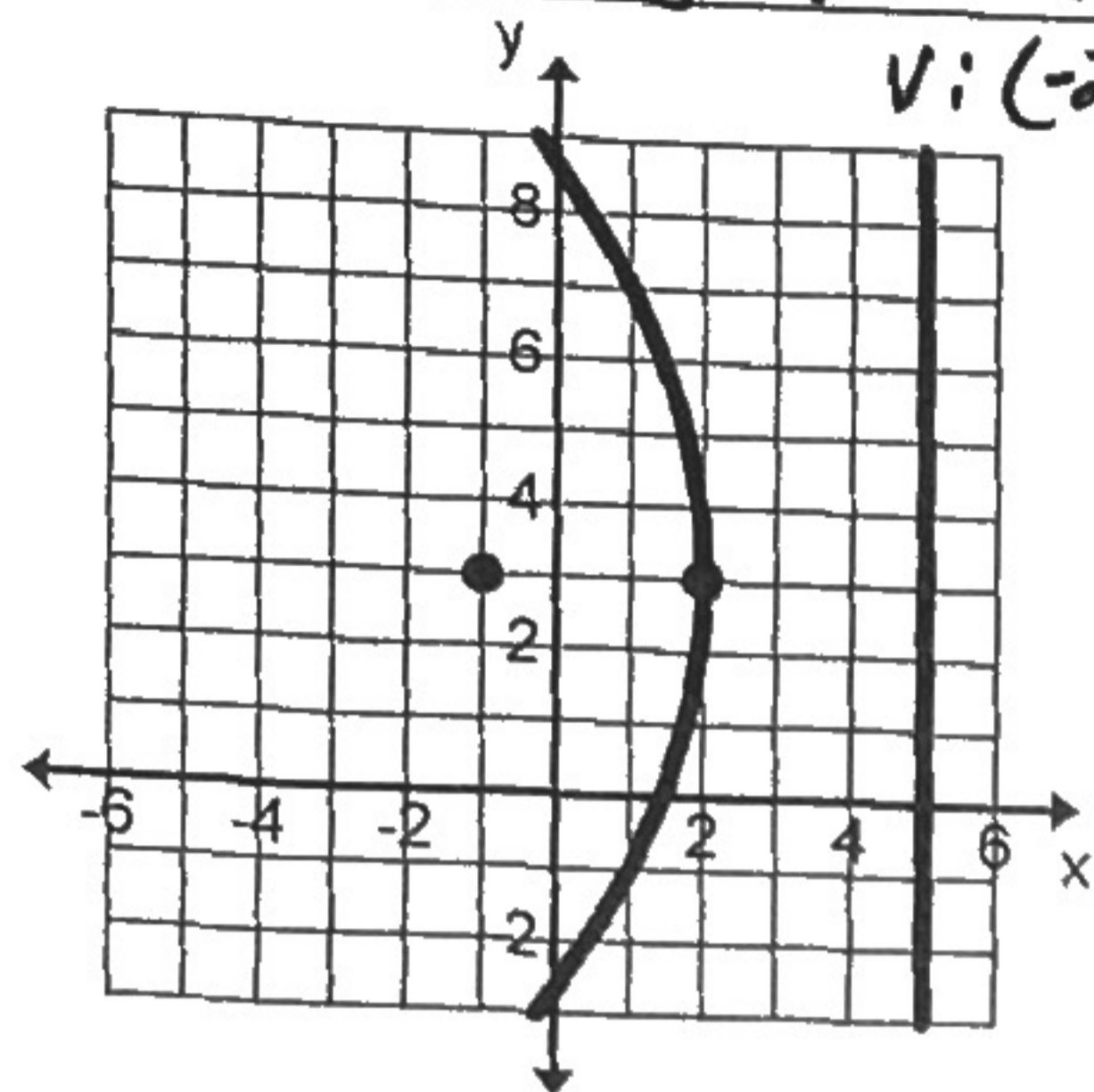
Center:  
 $(1, -2)$   
Transverse Axis  
Endpts:  
 $(1, 0)$   $(1, -4)$   
Conjugate Axis  
Endpts:  
 $(-4, -2)$   $(6, -2)$   
Focus:  
 $(1, -2 \pm \sqrt{29})$   
Eccentricity:  
 $e = \frac{\sqrt{29}}{2} = 2.69$   
Asymptotes:  
 $y + 2 = \pm \frac{2}{5}(x - 1)$

$$f^2 = 4 + 25$$

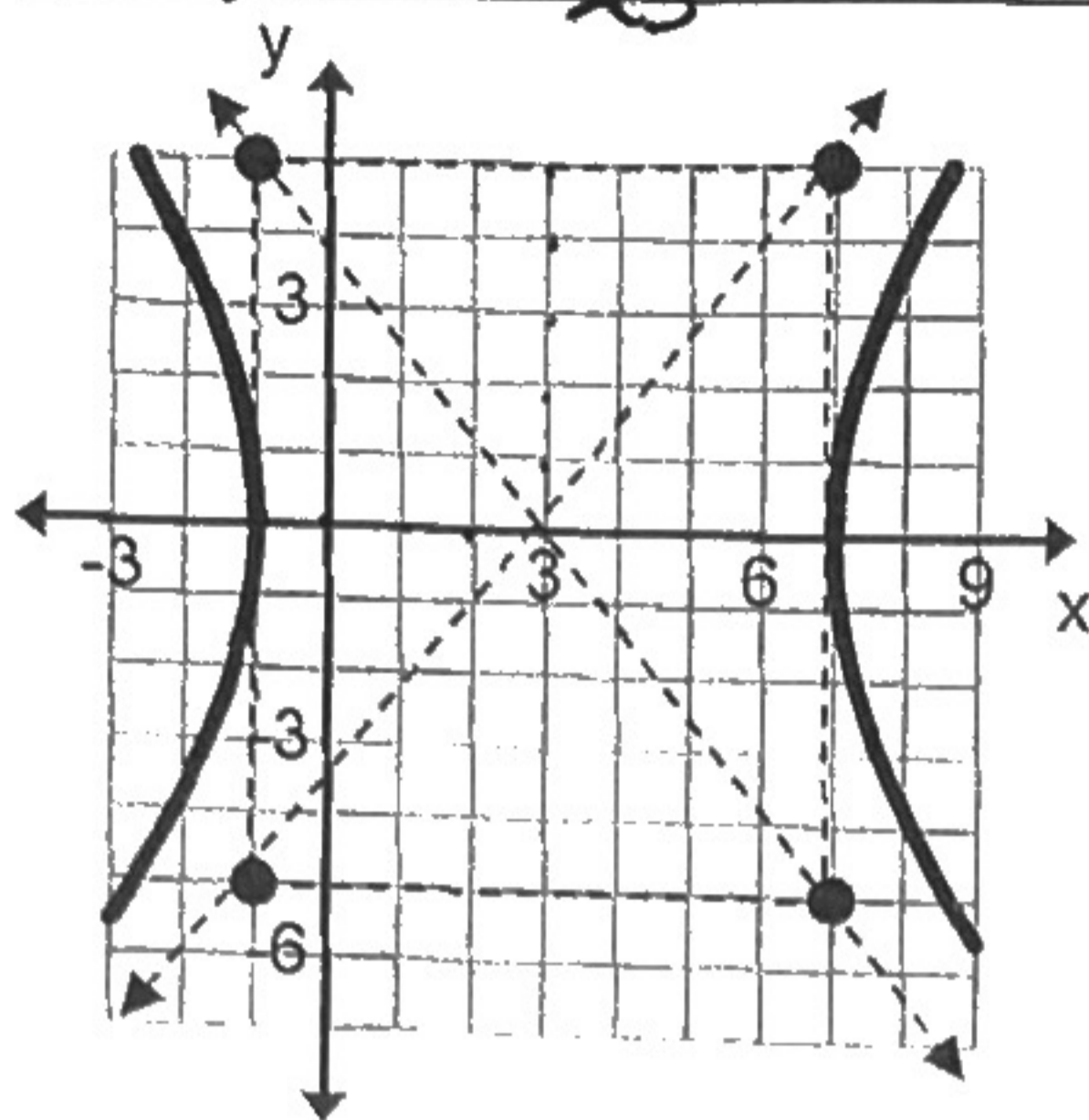
$$f = \sqrt{29}$$

Write an equation for each conic described.

5.  $x = -\frac{1}{12}(y-3)^2 - 2$   
 Vertex:  $(-2, 3)$



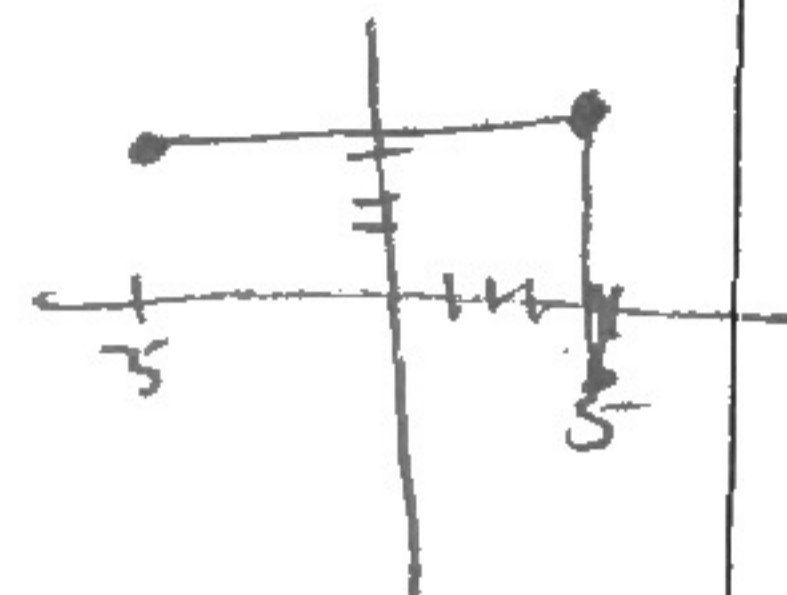
6.  $\frac{(x-3)^2}{16} - \frac{y^2}{25} = 1$



7.  $\frac{(x-5)^2}{100} + \frac{(y-3)^2}{16} = 1$

An ellipse with a major axis endpoint of  $(-5, 3)$  and a minor axis endpoint of  $(5, -1)$ .

Center:  $(5, 3)$

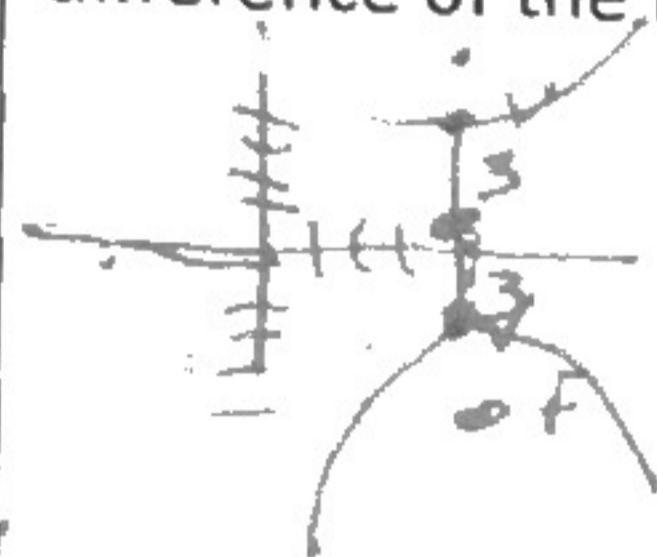


8.  $(x-18)^2 + (y+7)^2 = 324$

A circle with a center  $(18, -7)$  and tangent to the y-axis.

9.

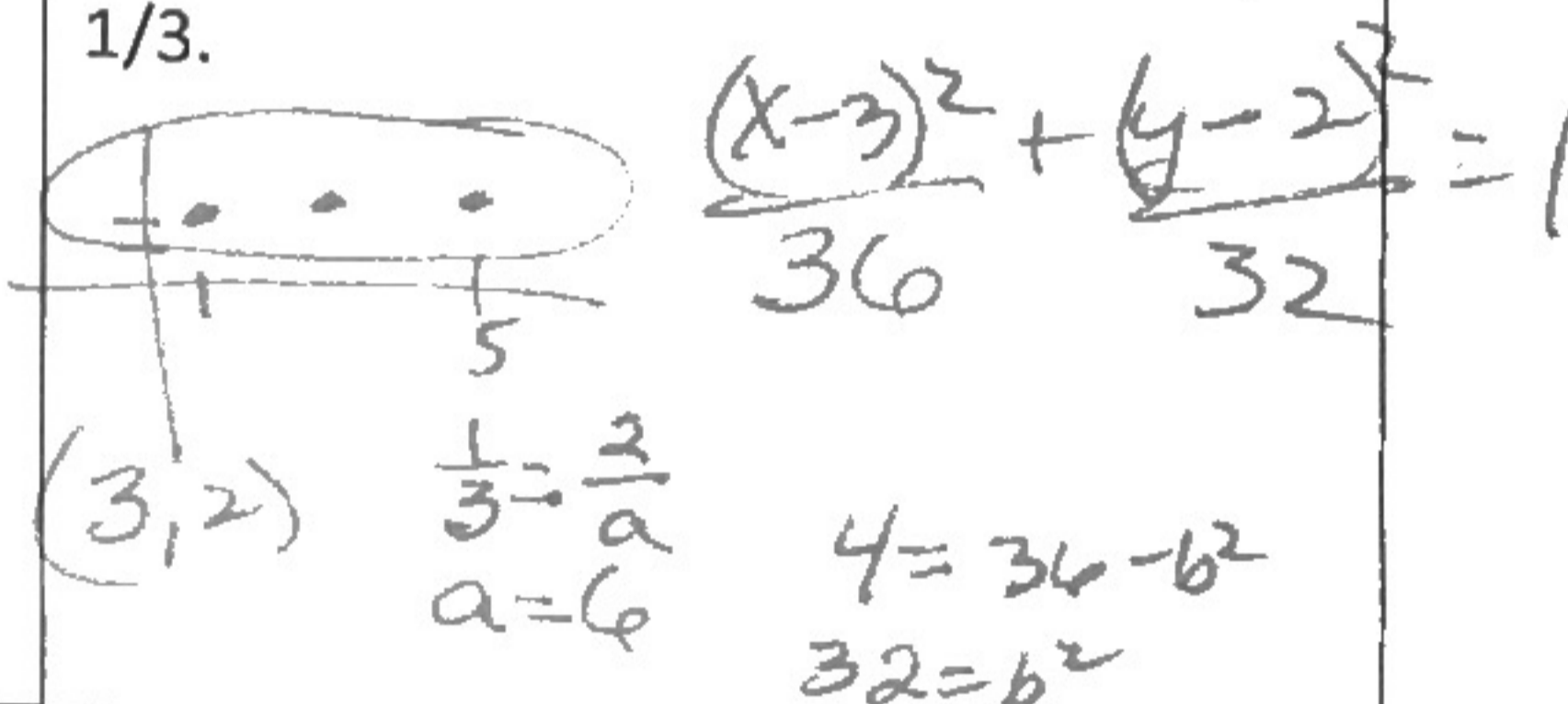
A hyperbola with a vertex of  $(4, 4)$  and a focal point of  $(4, -4)$  and the difference of the focal radii is 6.



$a = 3$

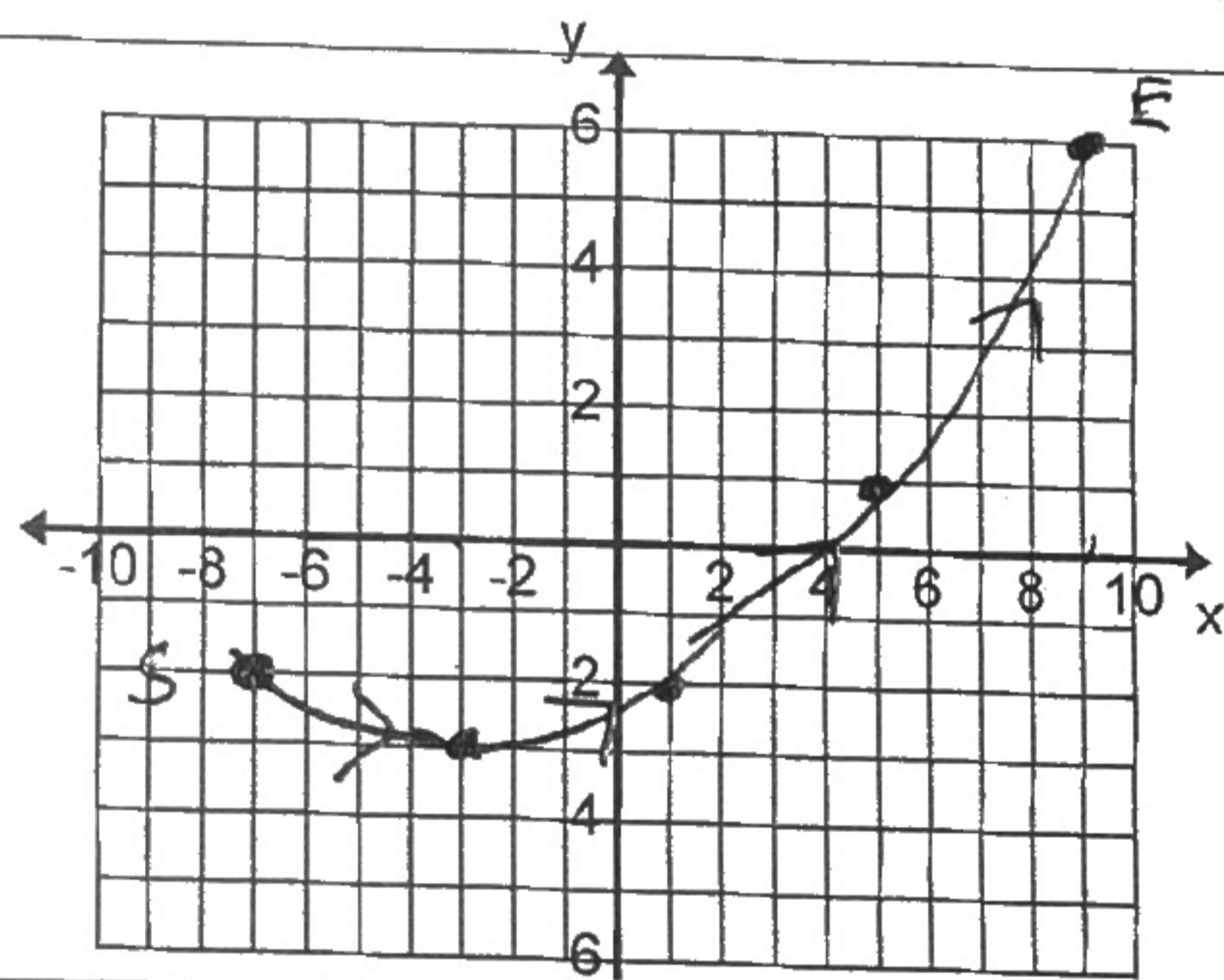
10.

An ellipse with focal end points of  $(1, 2)$  and  $(5, 2)$ , and an eccentricity of  $1/3$ .



11. Graph:  $x = 4t - 3$  and  $y = t^2 - 3$  for  $t$  in  $[-1, 3]$

$t$	-1	0	1	2	3
$x$	-7	-3	1	5	9
$y$	-2	-3	-2	1	6



Endpoints of the Curve:  $(-7, -2)$  and  $(9, 6)$

Domain:  $[-7, 9]$  Range:  $[-3, 6]$

Does the curve represent a function? yes

Why or why not? Passes VLT

Convert from Parametric to Rectangular by eliminating the parameter.

12.  $x = t - 5$   
 $y = t^2 + 3$

$t = x + 5$

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

13.  $x = 6 \cos T - 5$   
 $y = \sin T + 7$

$\frac{x+5}{6} = \cos T$      $y-7 = \sin T$

$\cos^2 \theta + \sin^2 \theta = 1$

$\frac{(x+5)^2}{36} + \frac{(y-7)^2}{1} = 1$

14.  $x = 2 \tan T - 2$   
 $y = 5 \sec T + 3$

$\frac{x+2}{2} = \tan T$      $\frac{y-3}{5} = \sec T$

$\frac{\cos^2 \theta + \sin^2 \theta}{\cos^2 \theta} = 1$

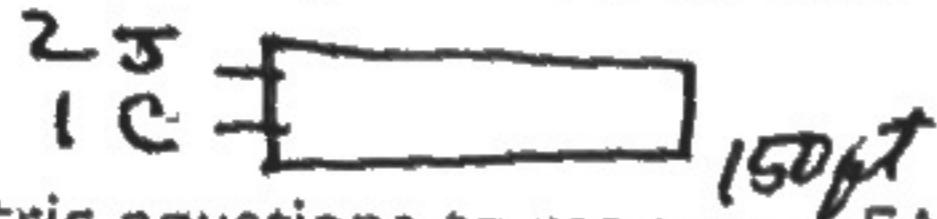
$1 + \tan^2 \theta = \sec^2 \theta$

$1 = \sec^2 \theta - \tan^2 \theta$

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

Keep going, more on the next page!!

15. Chris can sprint at 15 feet per second and Jason sprints at 18 feet per second. Jason gives Chris 20-foot head start.



A) Write a pair of parametric equations to represent EACH runner. Remember,  $d = rt$ .

CHRIS:  $x_1 = 15t + 20$   $y_1 = 1$

JASON:  $x_2 = 18t$   $y_2 = 2$

B) Find a viewing window to simulate a 50-yard dash. **WATCH YOUR UNITS.**

C) Who is ahead after 3 seconds? Who is ahead after 5 seconds? Who wins the race? What was the winner's time? 8.3 sec

t	2 seconds	6 seconds	
Chris	50	95	$15t + 20 = 150$ $15t = 130$ $t = 8.7 \text{ sec}$
Jason	36	90	$18t = 150$ $t = 8.3 \text{ sec}$

16. Mrs. E's dog, Coco, sees a squirrel in the back yard. The squirrel and Coco are both 100 feet away from the same tree that the squirrel is attempting to take refuge in, not knowing Coco just wants to play and race to the tree.

Coco:  $x_1 = 8(t-1)$ ;  $y_1 = 2$

Squire:  $x_1 = 9t$ ;  $y_1 = 3$ .

After 3 seconds, squirrel is ahead by 11 feet.

After 7 seconds, squirrel is ahead by 19 ft.

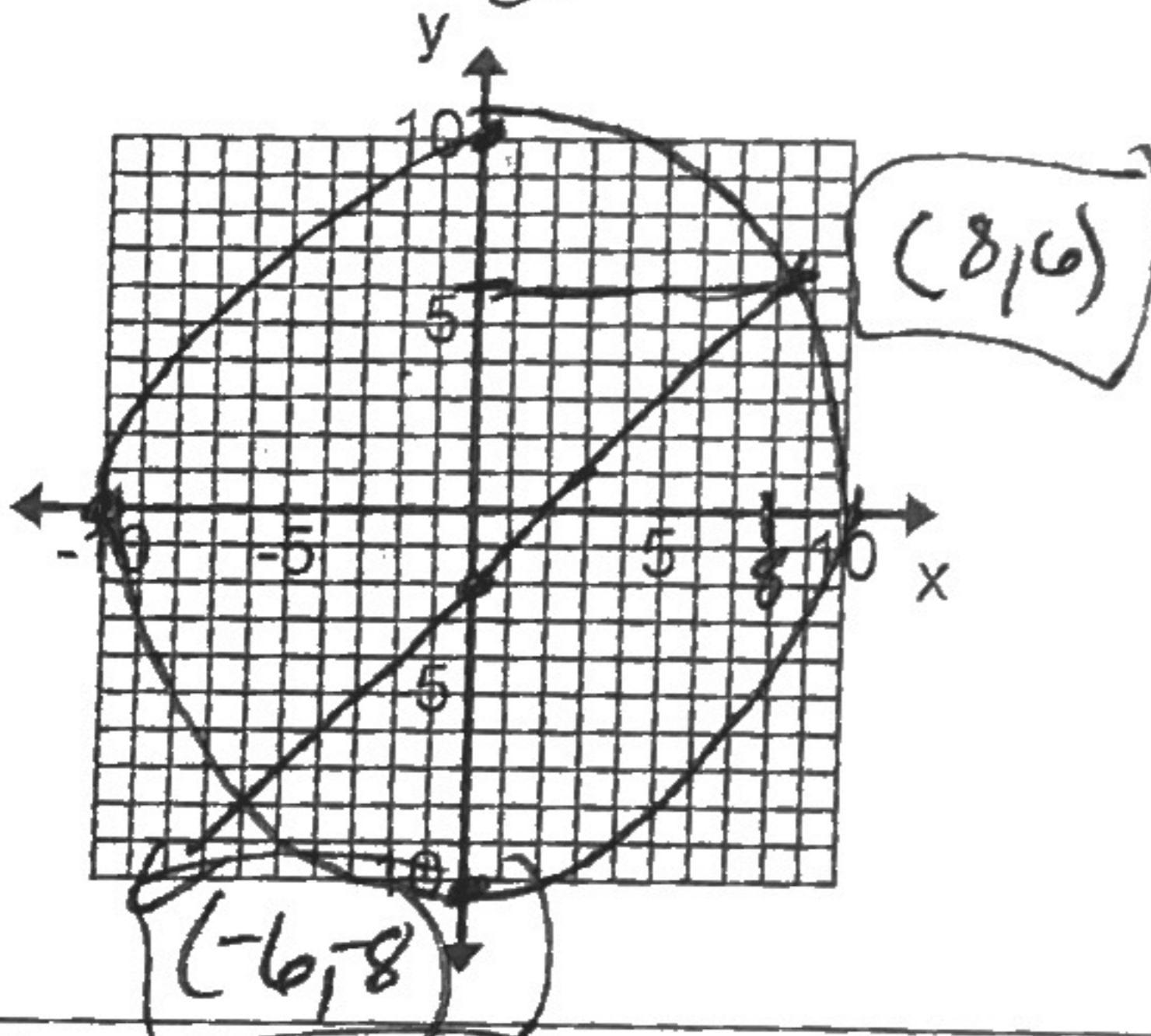
Squirrel wins the race by 19.2 feet with a winning time of 11.1 seconds

t	3 seconds	7 seconds	
Coco	16	48	$100 = 8t - 8$ $13.5t$
squirrel	27	63	$100 = 9t$ $11.1t$

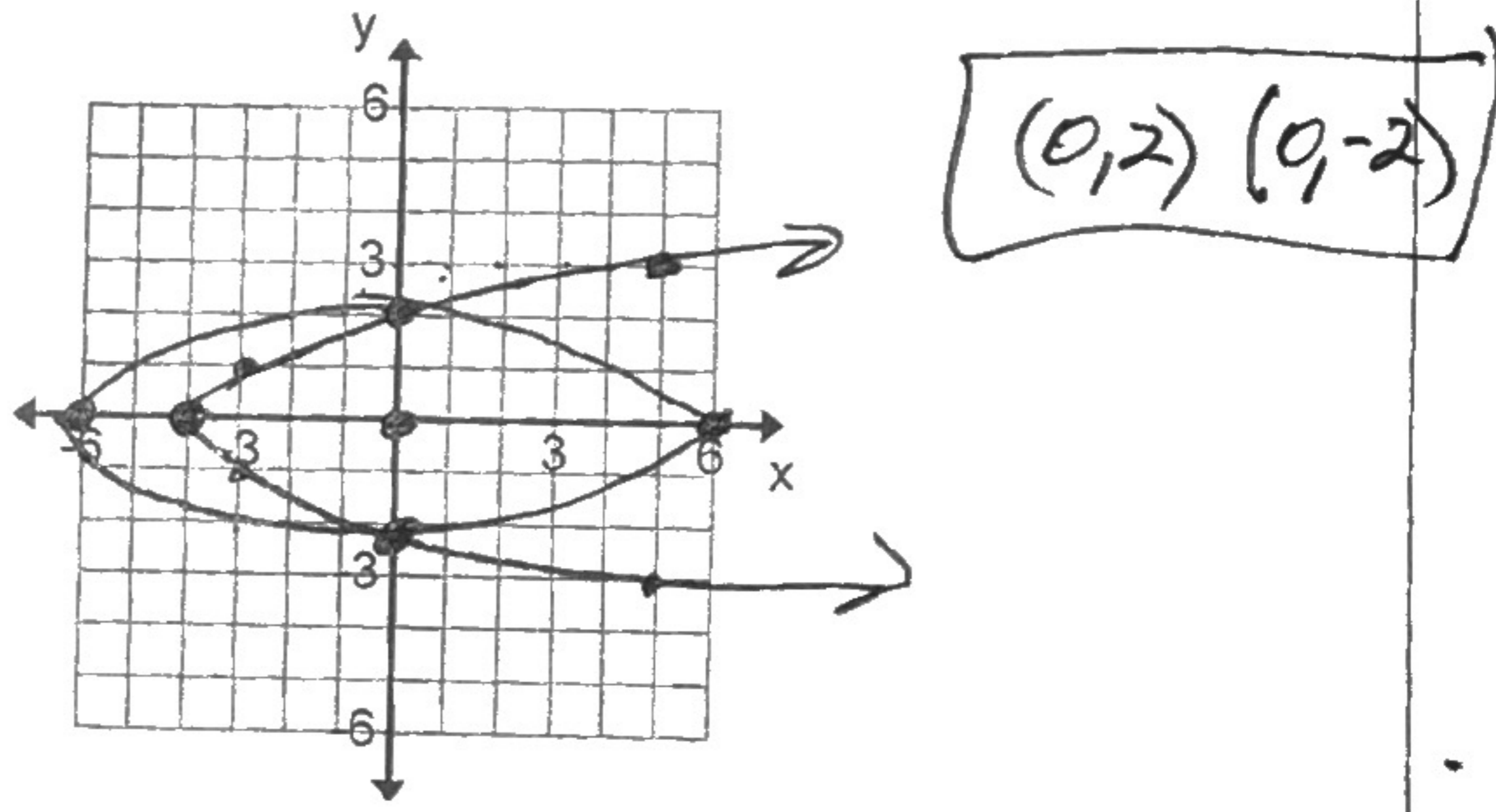
$x_1 = 8(11.1)$   
Distance @ 11.1 sec  
80.8 ft

Solve each System of Equations by GRAPHING:

17.  $x^2 + y^2 = 100$   
 $x - y = 2$   $y = x - 2$



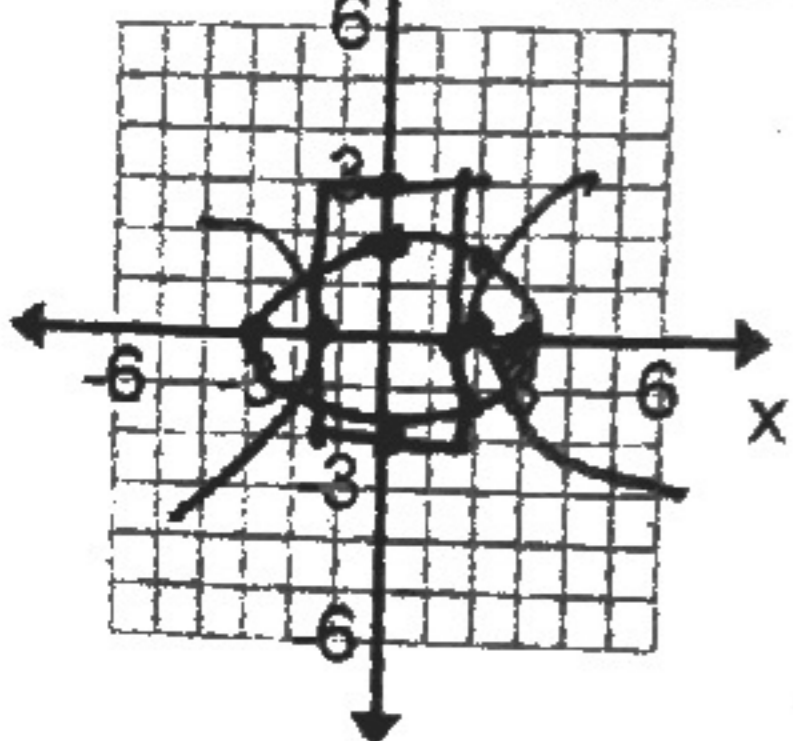
18.  $4x^2 + 36y^2 = 144$   
 $x = y^2 - 4$   $\frac{x^2}{36} + \frac{y^2}{4} = 1$



Solve each System of Equations by ALGEBRAICALLY:

19.  $x^2 + 2y^2 = 10$   
 $3x^2 - y^2 = 9$   
 $y^2 = 3x^2 - 9$   
 $x^2 + 2(3x^2 - 9) = 10$   
 $x^2 + 6x^2 - 18 = 10$   
 $7x^2 = 28$   
 $x^2 = 4$   
 $x = \pm 2$

$(2, \sqrt{3})$   $(2, -\sqrt{3})$   
 $(-2, \sqrt{3})$   $(-2, -\sqrt{3})$



$\frac{x^2}{10} + \frac{y^2}{5} = 1$   
 $\frac{x^2}{3} - \frac{y^2}{9} = 1$   
 $y^2 = 3(2)^2 - 9$   
 $y^2 = 3$   
 $y = \pm\sqrt{3}$

20.  $y^2 - x^2 = 4$   
 $y - 5 = 0$   
 $y = 5$   
 $5^2 - x^2 = 4$   
 $25 - 4 = x^2$   
 $\pm\sqrt{21} = x$

$(\sqrt{21}, 5)$   $(-\sqrt{21}, 5)$

