THE CIRCLE

Write the equation for the circle centred at the origin and with the given radius in standard form.

1) 9 2) 4 3) 5 4) 8 5) 1.5 6) 6

7) $\sqrt{5}$ 8) $2\sqrt{2}$

Write the equation for the circle with each centre and radius in standard form.

9) centre $(-2, 5)$, radius 3

10) centre $(-5, -1)$, radius 7

11) centre $(2, 8)$, radius 10

12) centre $(-3, 3)$, radius 12

13) centre $(-4, -5)$, radius 5

14) centre $(3, -4)$, radius 1.1

15) centre $(5, -4)$, radius $\sqrt{6}$

16) centre $(-6, 7)$, radius $3\sqrt{5}$

Find the centre and the radius of each circle.

17) $x^2 + y^2 = 121$

18) $x^2 + y^2 = 144$

19) $3x^2 + 3y^2 - 27 = 0$

20) $25x^2 + 25y^2 - 100 = 0$

21) $4x^2 + 4y^2 - 25 = 0$

22) $(x - 5)^2 + (y - 9)^2 = 16$

23) $(x + 3)^2 + (y - 1)^2 = 81$

24) $(x + 7)^2 + (y + 2)^2 - 64 = 0$

25) $(x - 6)^2 + (y + 4)^2 = 9.61$

26) $4(x + 1)^2 + 4(y - 3)^2 = 9$

Determine the equation in standard form for each circle. Then, expand it to find the general form.

27) centre $(8, 2)$, passing through $(5, 0)$

28) centre $(4, -6)$, passing through $(-8, 1)$

29) centre$(2, 3)$, passing through $(7, 2)$

30) centre $(-4, 5)$, tangent to the $x -$ axis

31) centre $(-6, -5)$, tangent to the y $-$ axis

Determine the equation in standard form for the circle with endpoints of a diameter at each pair of points.

32) $(3, -6)$ and $(3, 2)$

33) $(1, 4)$ and $(-3, -6)$

34) $(-3, 4)$ and $(5, 2)$

35) $(3, 10)$ and $(-7, -2)$

Find the centre and the radius of each circle.

36) $x^2 - 6x + y^2 - 8y - 39 = 0$

37) $x^2 - 7x + y^2 + 7y = 17.75$

38) $x^2 + 8x + y^2 + 4y = 12$

39) $x^2 + 8 + y^2 - 8y = 0$

Graph each circle.

40) $x^2 + y^2 = 40$

41) $5x^2 + 5y^2 - 100 = 0$

42) $(x - 4)^2 + (y + 6)^2 = 30$

43) $x^2 + 6x + y^2 - 4y = 37$

44) $2(x + 5)^2 + 2(y - 6)^2 = 48$

45) $x^2 + 8x + y^2 + 10y + 13 = 0$

ANSWERS:

1) $x^2 + y^2 = 81$ **2)** $x^2 + y^2 = 16$ **3)** $x^2 + y^2 = 25$ **4)** $x^2 + y^2 = 64$

5) $x^2 + y^2 = 2.25$ **6)** $x^2 + y^2 = 36$ **7)** $x^2 + y^2 = 5$ **8)** $x^2 + y^2 = 8$

9) $(x+2)^2 + (y-5)^2 = 9$ **10)** $(x+5)^2 + (y+1)^2 = 49$ **11)** $(x-2)^2 + (y-8)^2 = 100$

12) $(x+3)^2 + (y-3)^2 = 144$ **13)** $(x+4)^2 + (y+5)^2 = 25$ **14)** $(x-3)^2 + (y+4)^2 = 1.21$

15) $(x-5)^2 + (y+4)^2 = 6$ **16)** $(x+6)^2 + (y-7)^2 = 45$ **17)** $(0,0); 11$

18) $(0,0);\ 12$ **19)** $(0,0);\ 3$ **20)** $(0,0);\ 2$ **21)** $(0,0);\ \frac{5}{2}$

22) $(5,9);\ 4$ **23)** $(-3,1); 9$ **24)** $(-7,-2);\ 8$ **25)** $(6,-4);\ 3.1$

26) $(-1,3); \frac{3}{2}$

27) $(x-8)^2 + (y-2)^2 = 13; x^2 + y^2 - 16x - 4y + 55 = 0$

28) $(x-4)^2 + (y+6)^2 = 193; x^2 + y^2 - 8x + 12y - 141 = 0$

29) $(x-2)^2 + (y-3)^2 = 26; x^2 + y^2 - 4x - 6y - 13 = 0$

30) $(x+4)^2 + (y-5)^2 = 25; x^2 + y^2 + 8x - 10y + 16 = 0$

31) $(x+6)^2 + (y+5)^2 = 36; x^2 + y^2 + 12x + 10y + 25 = 0$

32) $(x-3)^2 + (y+2)^2 = 16$ **33)** $(x+1)^2 + (y+1)^2 = 29$ **34)** $(x-1)^2 + (y-3)^2 = 17$

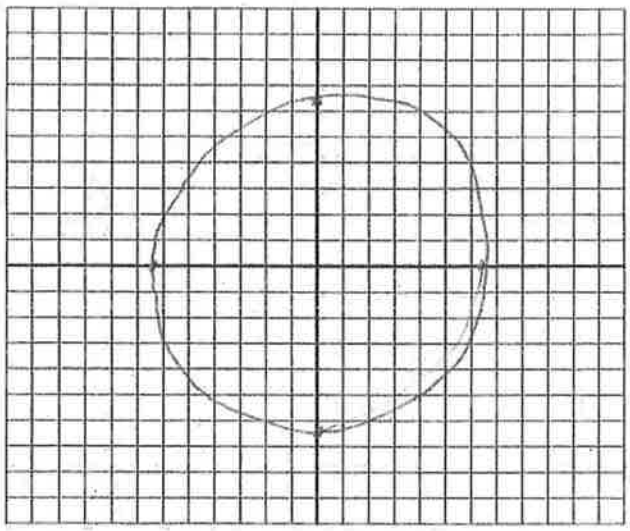
35) $(x+2)^2 + (y-4)^2 = 61$ **36)** $(3,4);\ 8$ **37)** $\left(\frac{7}{2}, -\frac{7}{2}\right); \frac{13}{2}$

38) $(-4,-2);\ 4\sqrt{2}$ **39)** $(0,4);\ 2\sqrt{2}$

p. 141 # 40-45 answers (graphing) CIRCLES

Name: _____ **Date:** _____

40.



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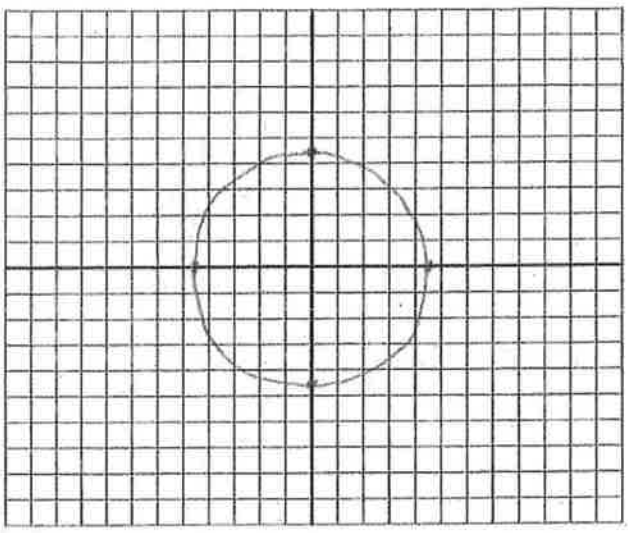

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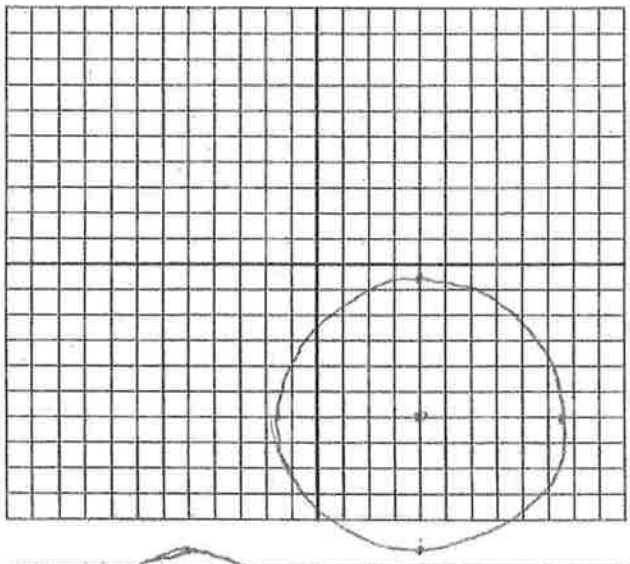

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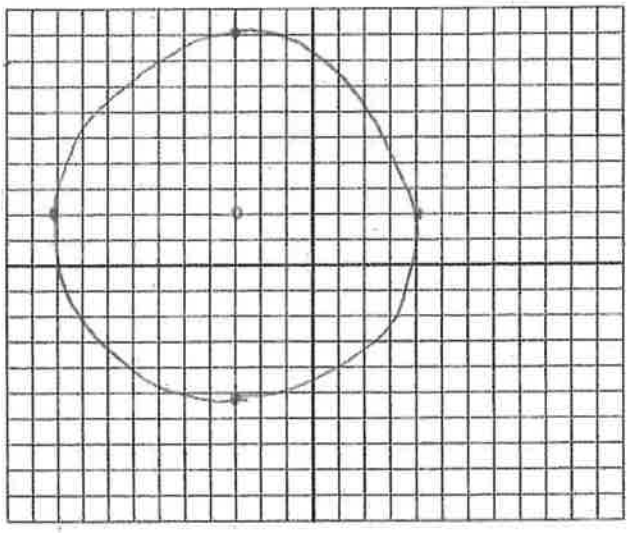

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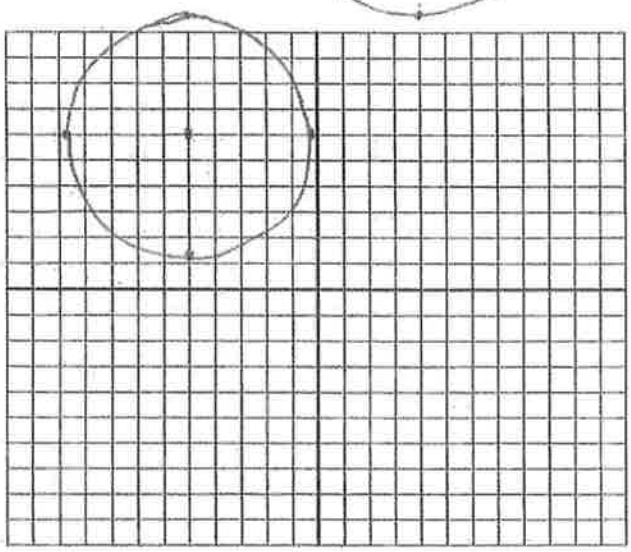

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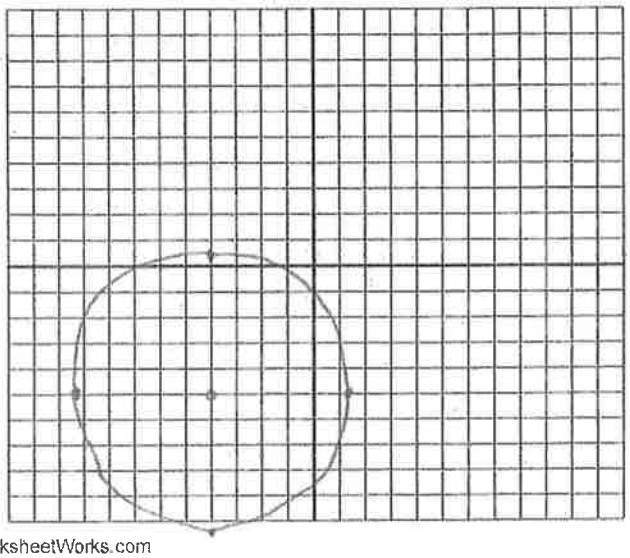
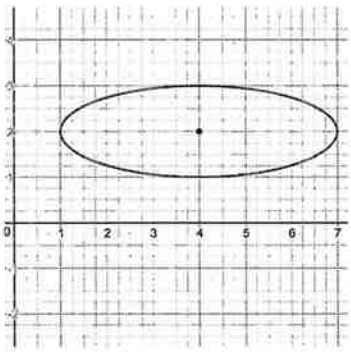


THE ELLIPSE

For each ellipse, determine the

a) Coordinates of the centre
b) Lengths of the major and minor axes
c) ***Coordinates of the foci***

1)



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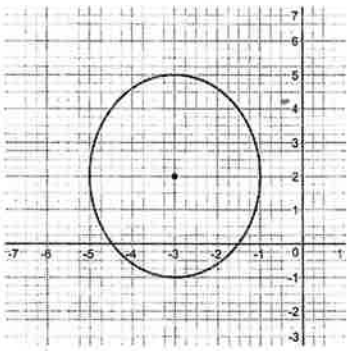

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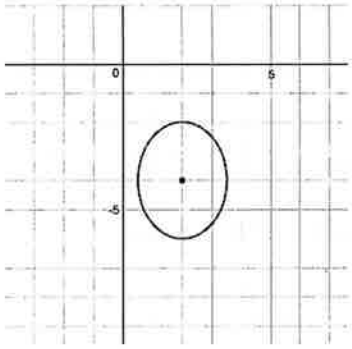

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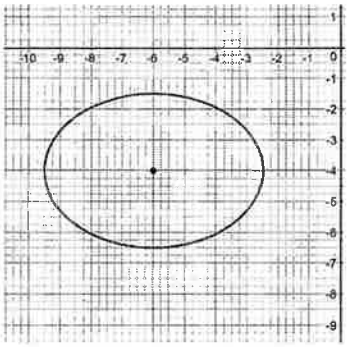


5) $\frac{x^2}{64} + \frac{y^2}{36} = 1$

6) $\frac{x^2}{16} + \frac{y^2}{49} = 1$

7) $\frac{(x-3)^2}{9} + \frac{(y-8)^2}{100} = 1$

8) $\frac{(x+7)^2}{4} + \frac{(y-5)^2}{25} = 1$

9) $9x^2 + 16y^2 = 144$

9) $49(x+12)^2 + 7(y-1)^2 = 49$

Sketch the graph of each ellipse.

11) $\frac{x^2}{9}+\frac{y^2}{25}=1$

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

13) $\frac{(x-3)^2}{16}+\frac{y^2}{4}=1$

14) $\frac{(x+1)^2}{81}+\frac{(y-2)^2}{49}=1$

15) $\frac{(x-5)^2}{4}+\frac{(y-6)^2}{25}=1$

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

17) $9x^2+36y^2=144$

18) $(x+3)^2+4(y-2)^2=36$

19) $4x^2+(y+1)^2=9$

20) $15(x+2)^2+\frac{(y+3)^2}{4}=4$

Write the equation for each ellipse in standard form and general form.

21) $centre\ (3,-2), passing\ through\ (-4,-2), (10,-2), (3,1), and\ (3,-5)$

22) $centre\ (-1,-2), passing\ through\ (-5,-2), (3,-2), (-1,4), and\ (-1,-8)$

23) $foci\ at\ (0,0)\ and\ (0,8), sum\ of\ focal\ radii\ 10$

24) $foci\ at\ (-1,-1)\ and\ (9,-1), sum\ of\ focal\ radii\ 26$

For each ellipse, determine the

a) coordinates of the centre
b) lengths of the major and minor axes
c) coordinates of the foci

25) $3x^2+y^2+6x-8y-11=0$

26) $x^2+121y^2-726y+968=0$

27) $9x^2+25y^2-9x-50y-197.75=0$

ANSWERS

1) a. $(4,2)$ **b.** $6,2$ **c.** $\left(4+2\sqrt{2},2\right),\left(4-2\sqrt{2},2\right)$

2) a. $(-3,2)$ **b.** $6,4$ **c.** $\left(-3,2+\sqrt{5}\right),\left(-3,2-\sqrt{5}\right)$

3) a. $(2,-4)$ **b.** $4,3$ **c.** $\left(2,-4+\frac{\sqrt{7}}{2}\right),\left(2,-4-\frac{\sqrt{7}}{2}\right)$

4) a. $(-6,-4)$ **b.** $7,5$ **c.** $\left(-6+\sqrt{6},-4\right),\left(-6-\sqrt{6},-4\right)$

5) a. $(0,0)$ **b.** $16,12$ **c.** $\left(2\sqrt{7},0\right),\left(-2\sqrt{7},0\right)$

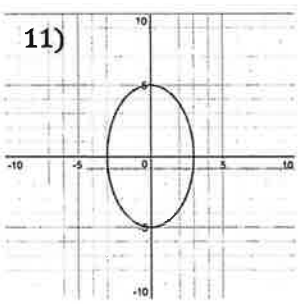
6) a. $(0,0)$ **b.** $14,8$ **c.** $\left(0,\sqrt{33}\right),\left(0,-\sqrt{33}\right)$

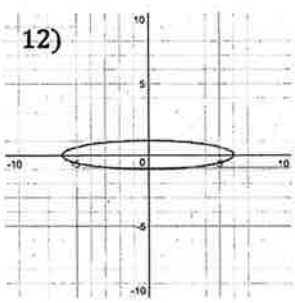
7) a. $(3,8)$ **b.** $20,6$ **c.** $\left(3,8+\sqrt{91}\right),\left(3,8-\sqrt{91}\right)$

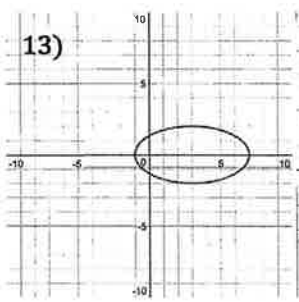
8) a. $(-7,5)$ **b.** $10,4$ **c.** $\left(-7,5+\sqrt{21}\right),\left(-7,5-\sqrt{21}\right)$

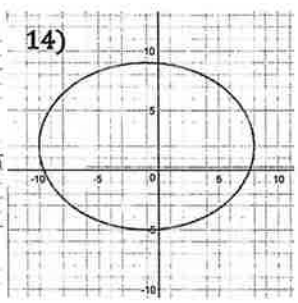
9) a. $(0,0)$ **b.** $8,6$ **c.** $\left(\sqrt{7},0\right),\left(-\sqrt{7},0\right)$

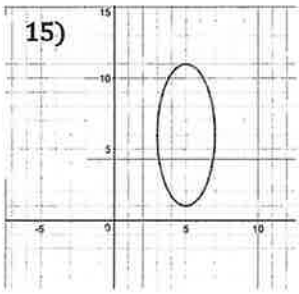
10) a. $(-12,1)$ **b.** $2\sqrt{7},2$ **c.** $\left(-12,1+\sqrt{6}\right),\left(-12,1-\sqrt{6}\right)$

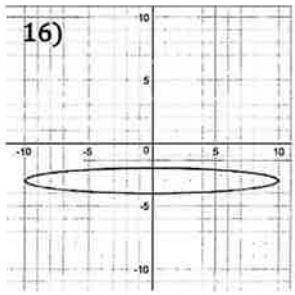


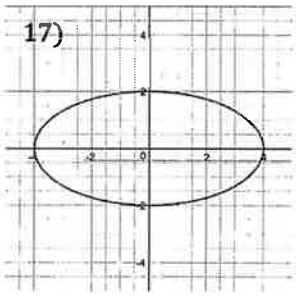


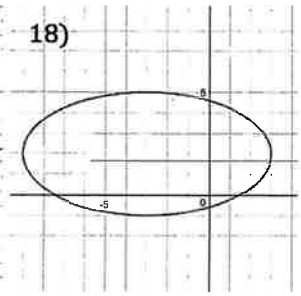












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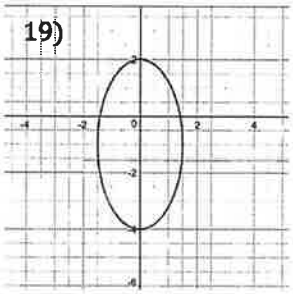

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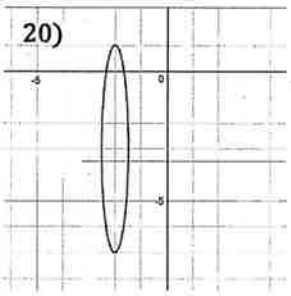


21) $\frac{(x-3)^2}{49}+\frac{(y+2)^2}{9}=1;\ 9x^2+49y^2-54x+196y-164=0$

22) $\frac{(x+1)^2}{16}+\frac{(y+2)^2}{36}=1;\ 9x^2+4y^2+18x+16y-119=0$

23) $\frac{x^2}{9}+\frac{(y-4)^2}{25}=1;\ 25x^2+9y^2-72y-81=0$

24) $\frac{(x-4)^2}{169}+\frac{(y+1)^2}{144}=1;\ 144x^2+169y^2-1152x+338y-21863=0$

25) a. $(-1,4)$ **b.** $2\sqrt{30}, 2\sqrt{10}$ **c.** $(-1,4+2\sqrt{5}), (-1,4-2\sqrt{5})$

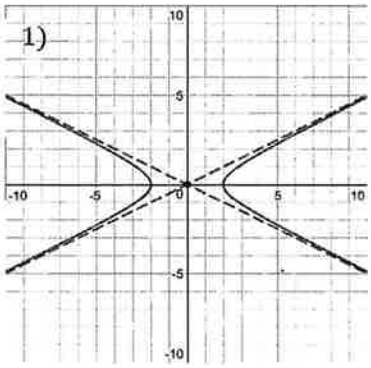
26) a. $(0,3)$ **b.** $22, 2$ **c.** $(2\sqrt{30},3), (-2\sqrt{30},3)$

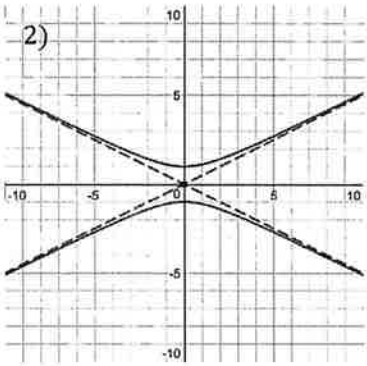
27) a. $\left(\frac{1}{2},1\right)$ **b.** $10, 6$ **c.** $\left(\frac{9}{2},1\right), \left(-\frac{7}{2},1\right)$

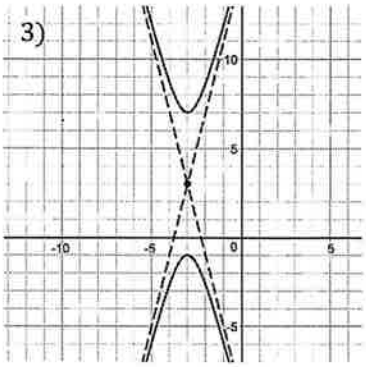
THE HYPERBOLA

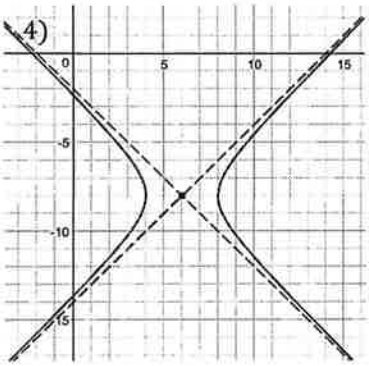
For each hyperbola, determine the

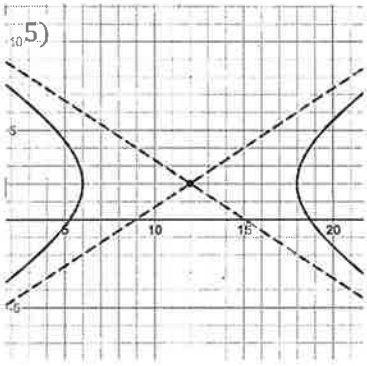
a) coordinates of the centre
b) directions and lengths of both axes
c) coordinates of the vertices
d) slopes of the asymptotes











For each hyperbola, determine the

a) coordinates of the centre
b) directions and lengths of both axes
c) coordinates of the vertices
d) slopes of the asymptotes

6) $\dfrac{x^2}{121} - \dfrac{y^2}{225} = 1$

7) $\dfrac{(x-1)^2}{144} - \dfrac{y^2}{64} = 1$

8) $\frac{(x+3)^2}{81} - \frac{(y-5)^2}{16} = 1$

9) $\frac{(y+4)^2}{49} - \frac{x^2}{100} = 1$

10) $\frac{4(y-8)^2}{9} - \frac{(x-2)^2}{169} = 1$

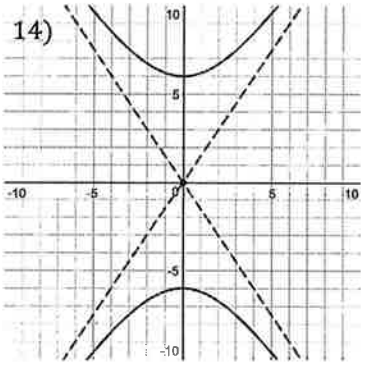
11) $\frac{y^2}{196} - \frac{(x-3)^2}{64} = 1$

12) $25(x+10)^2 - 36(y+4)^2 = 900$

13) $\frac{(y+6)^2}{9} - \frac{(x+2)^2}{256} = 1$

Determine the equation of each hyperbola in standard form and general form.

14)



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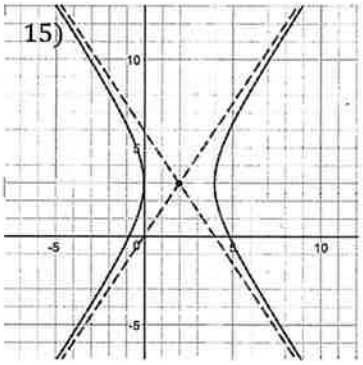

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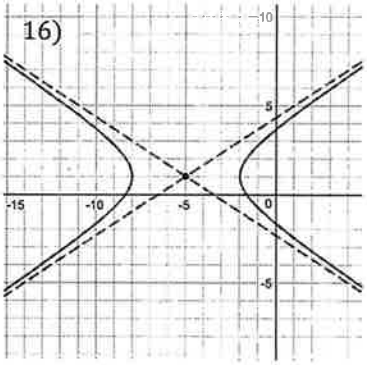

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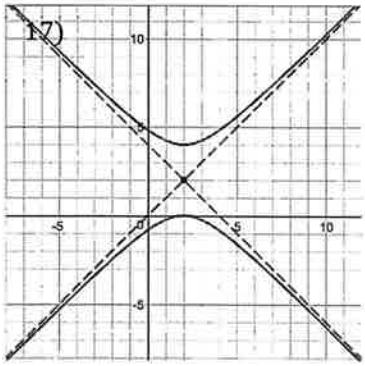

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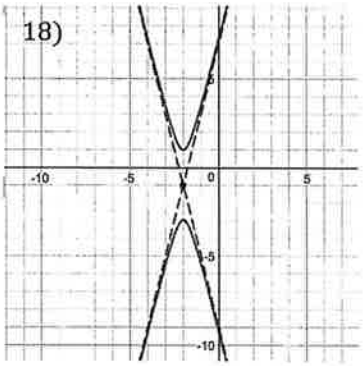


Write the equation for each hyperbola in standard form and general form.

19) centre $(4, 0)$, one vertex $(2, 0)$, slope of one asymptote $\frac{3}{2}$

20) centre $(0, 5)$, one focus $(5, 5)$, transverse axis 8

21) centre $(1, 2)$, one vertex $(1, 0)$, one focus $(1, 15)$

22) centre $(-1, 3)$, one focus $(-1, -2)$, difference of focal radii 6

23) centre $(6, -8)$, one vertex $(6, -20)$, slope of one asymptote 3

Sketch the graph of each hyperbola.

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

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

26) $\frac{(x+3)^2}{36} - \frac{(y+4)^2}{25} = 1$

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

28) $\frac{(y+5)^2}{16} - \frac{(x+1)^2}{49} = 1$

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

30) $4x^2 - y^2 = 36$

31) $4y^2 - 25(x-2)^2 = 100$

32) $9x^2 - 16(y+3)^2 = 144$

For each hyperbola, find the

a) coordinates of the centre
b) coordinates of the vertices
c) equations of the asymptotes

33) $x^2 - 4y^2 - 6x - 8y - 11 = 0$

34) $(y-1)^2 - 36(x+5)^2 = 9$

35) $x^2 - 10x - 36y^2 + 216y = 335$

36) $25x^2 - 4y^2 + 100x + 24y = 36$

ANSWERS

1) a. $(0,0)$ **b.** transverse axis: horizontal 4 units; conjugate axis: vertical 2 units **c.** $(2,0), (-2,0)$ **d.** $\pm\frac{1}{2}$

2) a. $(0,0)$ **b.** transverse axis: vertical 2 units; conjugate axis: horizontal 4 units **c.** $(0,1), (0,-1)$ **d.** $\pm\frac{1}{2}$

3) a. $(-3,3)$ **b.** transverse axis: vertical 8 units; conjugate axis: horizontal 2 units **c.** $(-3,7), (-3,-1)$ **d.** ± 4

4) a. $(6,-8)$ **b.** transverse axis: horizontal 4 units; conjugate axis: vertical 4 units **c.** $(8,-8), (4,-8)$ **d.** ± 1

5) a. $(12,2)$ **b.** transverse axis: horizontal 12 units; conjugate axis: vertical 8 units **c.** $(18,2), (6,2)$ **d.** $\pm\frac{2}{3}$

6) a. $(0,0)$ **b.** transverse axis: horizontal 22 units; conjugate axis: vertical 30 units **c.** $(11,0), (-11,0)$ **d.** $\pm\frac{15}{11}$

7) a. $(1,0)$ **b.** transverse axis: horizontal 24 units; conjugate axis: vertical 16 units **c.** $(13,0), (-11,0)$ **d.** $\pm\frac{2}{3}$

8) a. $(-3,5)$ **b.** transverse axis: horizontal 18 units; conjugate axis: vertical 8 units **c.** $(6,5), (-12,5)$ **d.** $\pm\frac{4}{9}$

9) a. $(0,-4)$ **b.** transverse axis: vertical 14 units; conjugate axis: horizontal 20 units **c.** $(0,3), (0,-11)$ **d.** $\pm\frac{7}{10}$

10) a. $(2,8)$ **b.** transverse axis: vertical 3 units; conjugate axis: horizontal 26 units **c.** $\left(2,\frac{19}{2}\right), \left(2,\frac{13}{2}\right)$ **d.** $\pm\frac{3}{26}$

11) a. $(3,0)$ **b.** transverse axis: vertical 28 units; conjugate axis: horizontal 16 units **c.** $(3,14), (3,-14)$ **d.** $\pm\frac{7}{4}$

12) a. $(-10,-4)$ **b.** transverse axis: horizontal 12 units; conjugate axis: verticla 10 units **c.** $(-16,-4), (-4,-4)$

d. $\pm\frac{5}{6}$

13) a. $(-2,-6)$ **b.** transverse axis: vertical 6 units; conjugate axis: horizontal 32 units **c.** $(-2,-3), (-2,-9)$

d. $\pm\frac{3}{16}$

14) $\frac{y^2}{36}-\frac{x^2}{16}=1;\ 9x^2-4y^2+144=0$

15) $\frac{(x-2)^2}{4}-\frac{(y-3)^2}{9}=1;\ 9x^2-4y^2-36x+24y-36=0$

16) $\frac{(x+5)^2}{9}-\frac{(y-1)^2}{4}=1;\ 4x^2-9y^2+40x+18y+55=0$

17) $\frac{(y-2)^2}{4} - \frac{(x-2)^2}{4} = 1;\ x^2 - y^2 - 4x + 4y + 4 = 0$

18) $\frac{(y+1)^2}{4} - \frac{(x+2)^2}{\frac{1}{4}} = 1;\ 16x^2 - y^2 + 64x - 2y + 67 = 0$

19) $\frac{(x-4)^2}{4} - \frac{y^2}{9} = 1;\ 9x^2 - 4y^2 - 72x + 108 = 0$

20) $\frac{x^2}{16} - \frac{(y-5)^2}{9} = 1;\ 9x^2 - 16y^2 + 160y - 544 = 0$

21) $\frac{(y-2)^2}{4} - \frac{(x-1)^2}{165} = 1;\ 4x^2 - 165y^2 - 8x + 660y + 4 = 0$

22) $\frac{(y-3)^2}{9} - \frac{(x+1)^2}{16} = 1;\ 9x^2 - 16y^2 + 18x + 96y + 9 = 0$

23) $\frac{(y+8)^2}{144} - \frac{(x-6)^2}{16} = 1;\ 9x^2 - y^2 - 108x - 16y + 404 = 0$

33) a. $(3, -1)$ **b.** $(7, -1)$ and $(-1, -1)$ **c.** $x - 2y - 5 = 0$ and $x + 2y - 1 = 0$

34) a. $(-5, 1)$ **b.** $(-5, 4)$ and $(-5, -2)$ **c.** $6x + y + 29 = 0$ and $6x - y + 31 = 0$

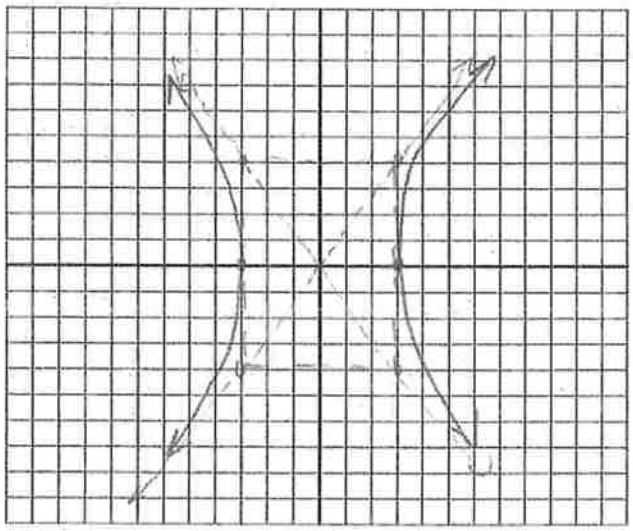
35) a. $(5, 3)$ **b.** $(11, 3)$ and $(-1, 3)$ **c.** $x - 6y + 13 = 0$ and $x + 6y - 23 = 0$

36) a. $(-2, 3)$ **b.** $(0, 3)$ and $(-4, 3)$ **c.** $5x - 2y + 16 = 0$ and $5x + 2y + 4 = 0$

p. 161 # 24-32 answers (graphs) HYPERBOLAS

Name: _____ Date: _____

24.



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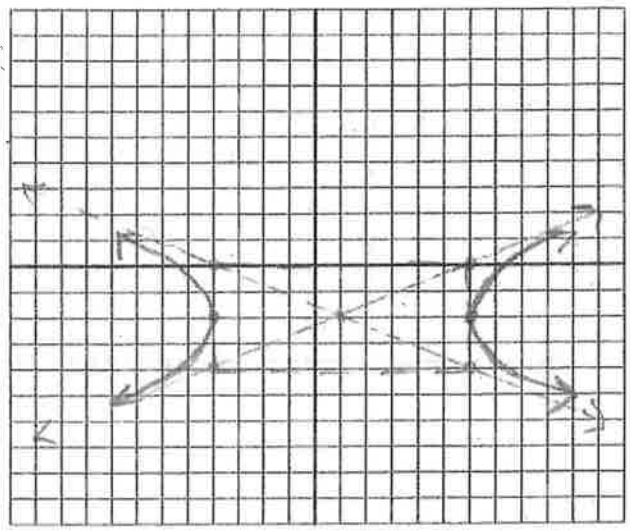

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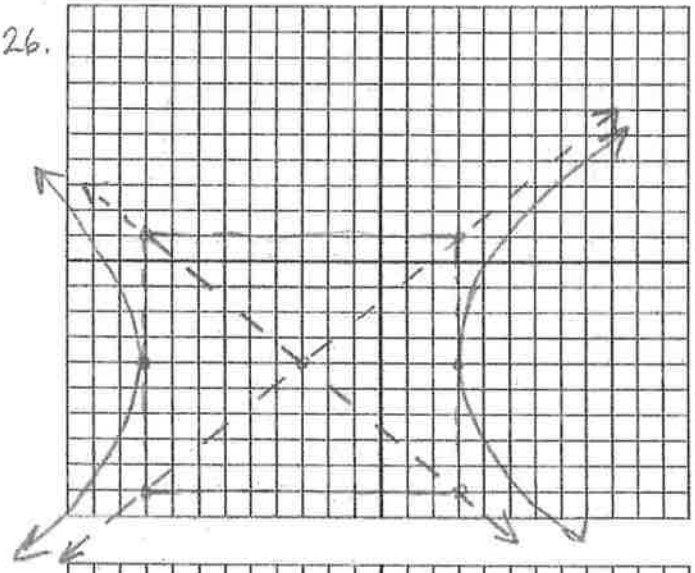

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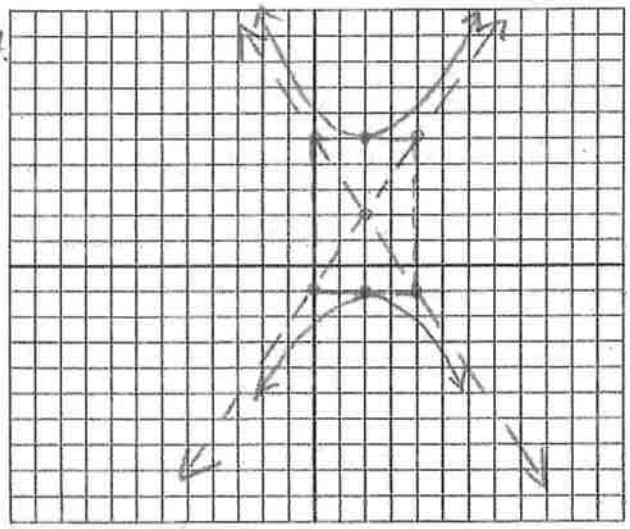

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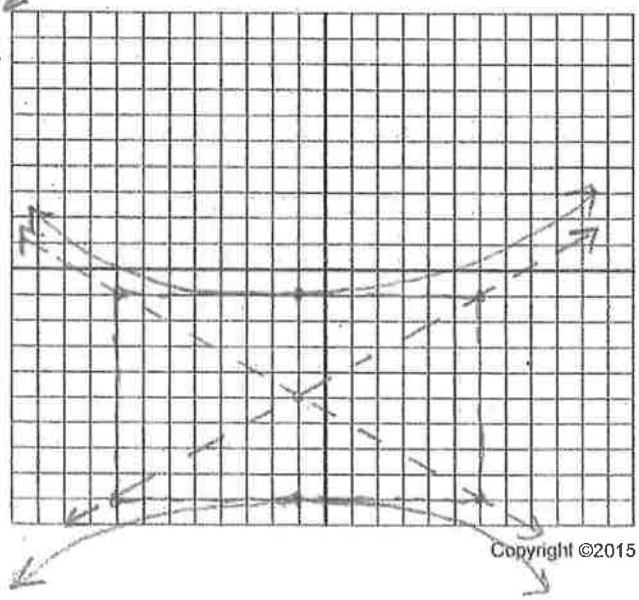

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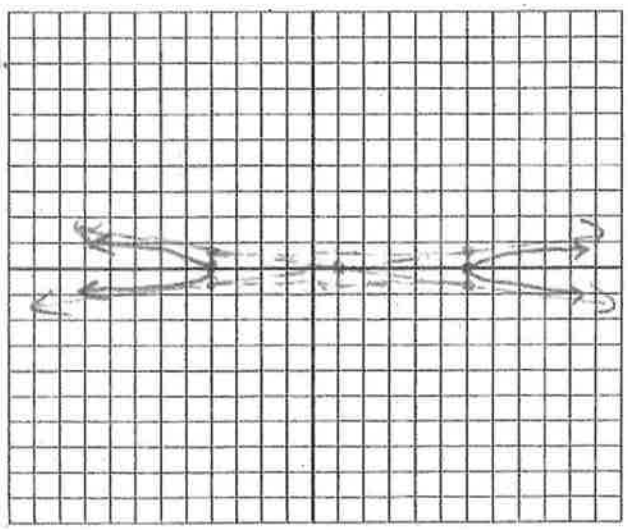

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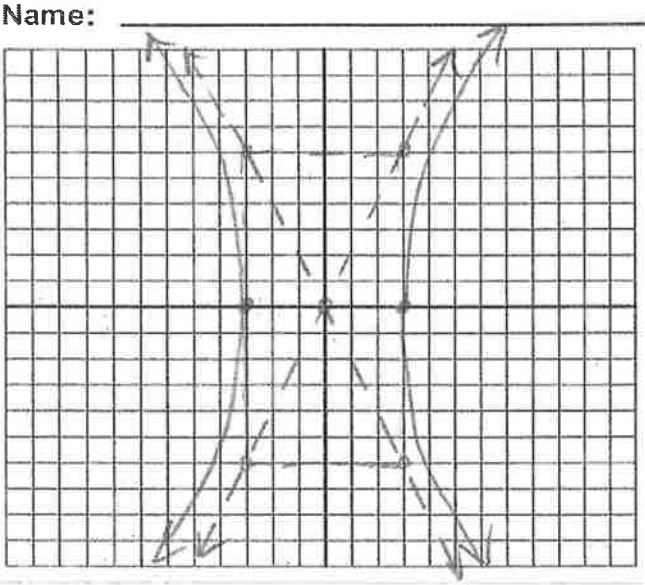

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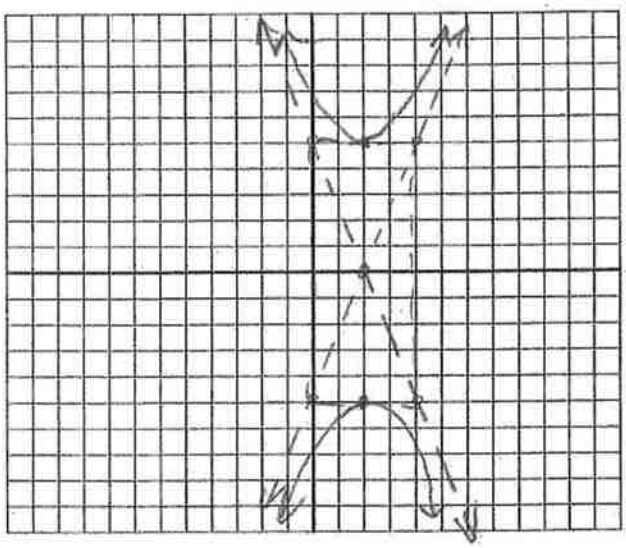

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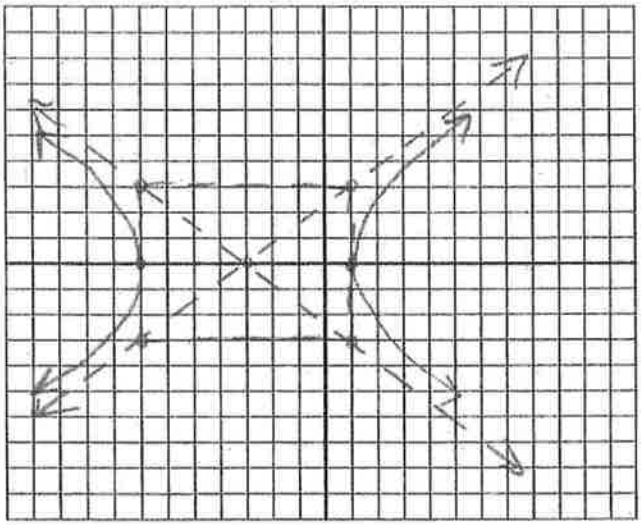


THE PARABOLA

Write the equation of the parabola with each focus and directrix in standard form.

1) $(0, 2), y = -4$ 2) $(0, -3), y = 2$ 3) $(4, 0), x = 1$ 4) $(-3, 0), x = 1$

5) $(2, 2), y = -1$ 6) $(-3, -2), x = -1$ 7) $(-5, -1), x = 5$ 8) $(-4, 4), y = 5$

Write the equation for each parabola in standard form and general form.

9) vertex at $(4, 2)$, focus 3 units to left of vertex

10) vertex at $(-3, -1)$, directrix 2 units above vertex

11) vertex at origin, focus at $(-3, 0)$

12) passing through $(2, -1)$, vertex at $(-7, -5)$, opens to right

13) axis of symmetry $x = 2$, focus at $(2, -6)$, $p = -2$

14) focus at $(1, 2)$, $p = 2$, opens up

Find the coordinates of the focus and the vertex, the equations of the directrix and the axis of symmetry, and the direction of opening of each parabola.

15) $y^2 - 12x = 0$ 16) $x^2 + 3y = 6x$

17) $x^2 + 4x = -2y - 10$ 18) $2y^2 + 16x = 16y - 64$

Classify the conic section represented by each equation.

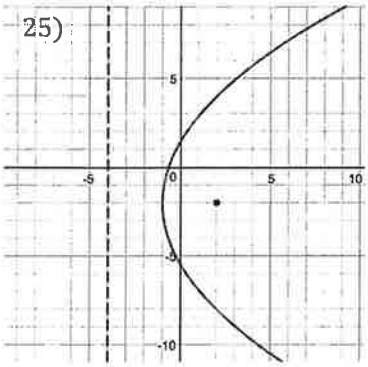
19) $4x^2 + y^2 - 8x - 6y = 0$ 20) $x^2 + y^2 + 2x - 7 = 0$

21) $16x^2 - 12y^2 + 5y - 3 = 0$ 22) $6x^2 + 3x - 10y = 0$

23) $7y^2 - 5x - 11y = 0$ 24) $8x^2 + 8y^2 + 3x - 6y - 13 = 0$

Write the equation for each conic section in standard form and general form.

25)



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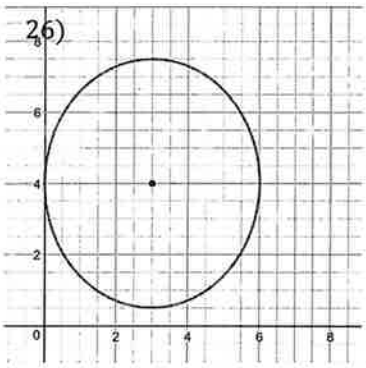

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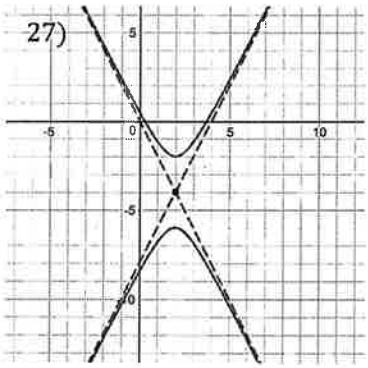

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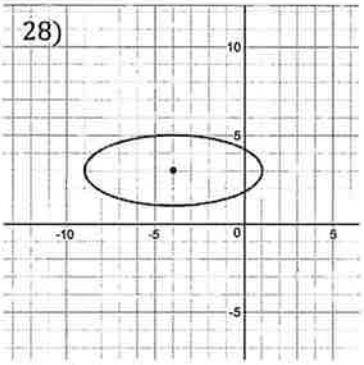

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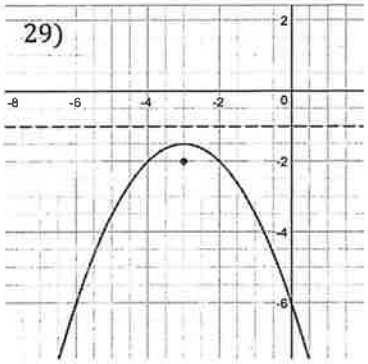

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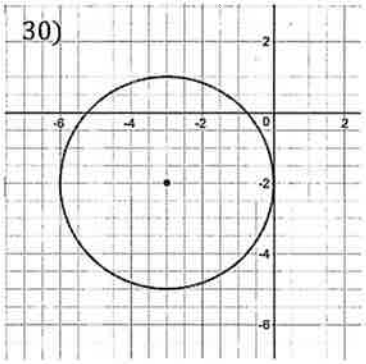

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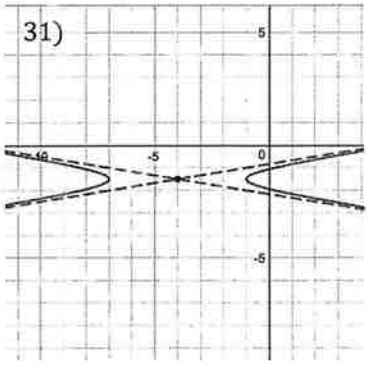


Express each equation in standard form. Then, graph the conic section.

32) $x^2 + y^2 + 8x - 6y = 0$

33) $x^2 + y^2 + 10y + 9 = 0$

34) $16x^2 + 25y^2 - 400 = 0$

35) $9x^2 - 16y^2 = -1$

36) $x^2 - 4x - 2y - 6 = 0$

37) $y^2 - 2x - 8y + 22 = 0$

38) $x^2 - 4y^2 + 6x - 8y - 11 = 0$

39) $3x^2 + 24x + 2y + 54 = 0$

40) $16x^2 - 9y^2 - 32x + 36y + 124 = 0$

41) $4x^2 + 25y^2 - 24x + 200y + 336 = 0$

42) $4x^2 + 9y^2 - 16x + 18y - 11 = 0$

43) $64x^2 + 9y^2 - 384x - 36y + 468 = 0$

ANSWERS

1) $x^2 = 12(y+1)$ **2)** $x^2 = -10(y+\frac{1}{2})$ **3)** $y^2 = 6(x-\frac{5}{2})$ **4)** $y^2 = -8(x+1)$

5) $(x-2)^2 = 6(y-\frac{1}{2})$ **6)** $(y+2)^2 = -4(x+2)$ **7)** $(y+1)^2 = -20x$

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

9) $(y-2)^2 = -12(x-4)$; $y^2 + 12x - 4y - 44 = 0$

10) $(x+3)^2 = -8(y+1)$; $x^2 + 6x + 8y + 17 = 0$

11) $y^2 = -12x$; $y^2 + 12x = 0$

12) $(y+5)^2 = \frac{16}{9}(x+7)$; $y^2 - \frac{16}{9}x + 10y + \frac{113}{9} = 0$

13) $(x-2)^2 = -8(y+4)$; $x^2 - 4x + 8y + 36 = 0$

14) $(x-1)^2 = 8y$; $x^2 - 2x - 8y + 1 = 0$

15) focus: $(3,0)$; vertex: $(0,0)$; directrix: $x = -3$; axis of symmetry: $y = 0$; opens right.

16) focus: $\left(3, \frac{9}{4}\right)$; vertex: $(3,3)$; directrix: $y = \frac{15}{4}$; axis of symmetry: $x = 3$; opens down.

17) focus: $\left(-2, -\frac{7}{2}\right)$; vertex: $(-2,-3)$; directrix: $y = -\frac{5}{2}$; axis of symmetry: $x = -2$; opens down.

18) focus: $(-4,4)$; vertex: $(-2,4)$; directrix: $x = 0$; axis of symmetry: $y = 4$; opens left.

19) ellipse **20)** circle **21)** hyperbola **22)** parabola **23)** parabola **24)** circle

25) $(y+2)^2 = 12(x+1)$; $y^2 - 12x + 4y - 8 = 0$

26) $\frac{(x-3)^2}{9} + \frac{(y-4)^2}{\frac{49}{4}} = 1$; $49x^2 + 36y^2 - 294x - 288y + 576 = 0$

27) $\frac{(y+4)^2}{4} - (x-2)^2 = 1$; $4x^2 - y^2 - 16x - 8y + 4 = 0$

28) $\frac{(x+4)^2}{25} + \frac{(y-3)^2}{4} = 1$; $4x^2 + 25y^2 + 32x - 150y + 189 = 0$

29) $(x+3)^2 = -2\left(y + \frac{3}{2}\right)$; $x^2 + 6x + 2y + 12 = 0$

30) $(x+3)^2 + (y+2)^2 = 9;\ x^2 + y^2 + 6x + 4y + 4 = 0$

31) $\dfrac{(x+4)^2}{9} - \dfrac{\left(y+\frac{3}{2}\right)^2}{\frac{1}{4}} = 1; x^2 - 36y^2 + 8x - 108y - 74 = 0$

32) $(x+4)^2 + (y-3)^2 = 25$

33) $x^2 + (y+5)^2 = 16$

34) $\dfrac{x^2}{25} + \dfrac{y^2}{16} = 1$

35) $\dfrac{y^2}{\frac{1}{16}} - \dfrac{x^2}{\frac{1}{9}} = 1$

36) $(x-2)^2 = 2(y+5)$

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

38) $\dfrac{(x+3)^2}{16} - \dfrac{(y+1)^2}{4} = 1$

39) $(x+4)^2 = -\dfrac{2}{3}(y+3)$

40) $\dfrac{(y-2)^2}{16} - \dfrac{(x-1)^2}{9} = 1$

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

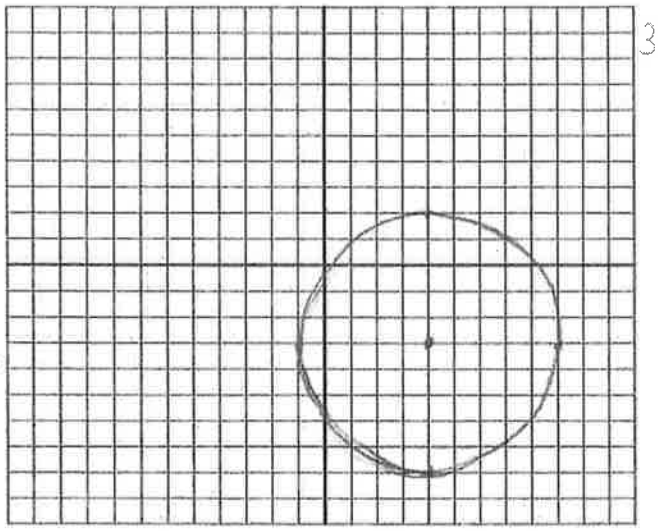
42) $\dfrac{(x-2)^2}{9} - \dfrac{(y+1)^2}{4} = 1$

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

p. 168 # 32 - 43 answers (graphs) ALL CONICS within PARABOLA Section

Name: _____ **Date:** _____

32.



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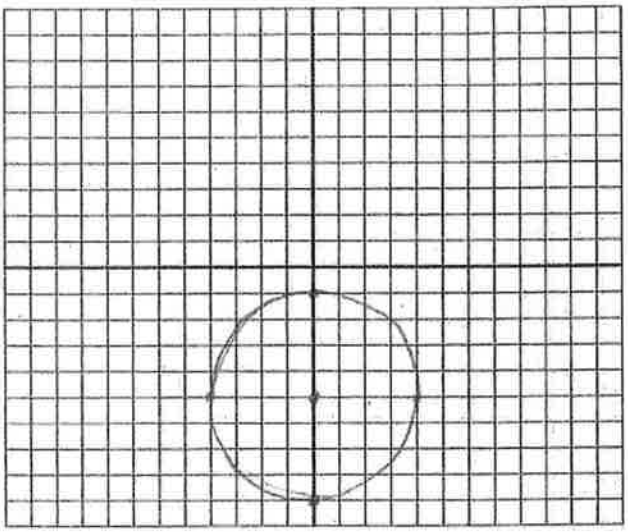

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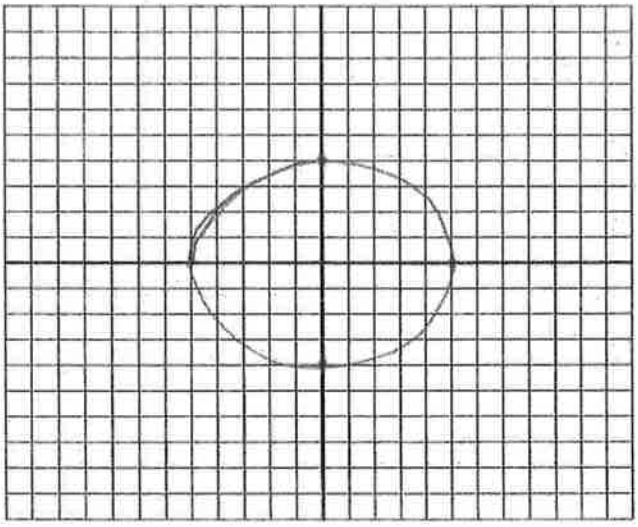

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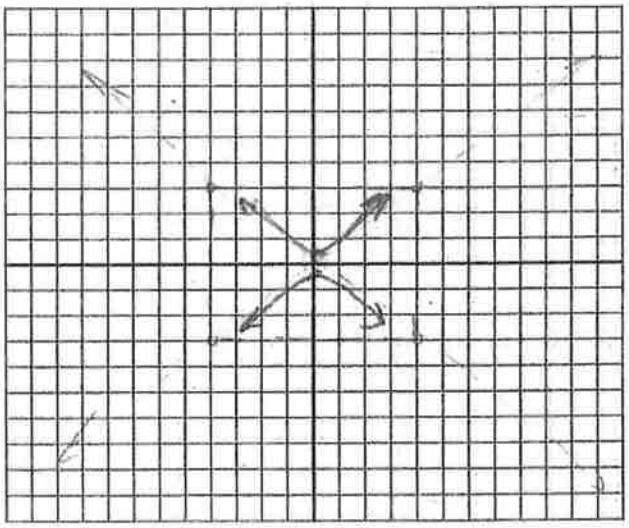

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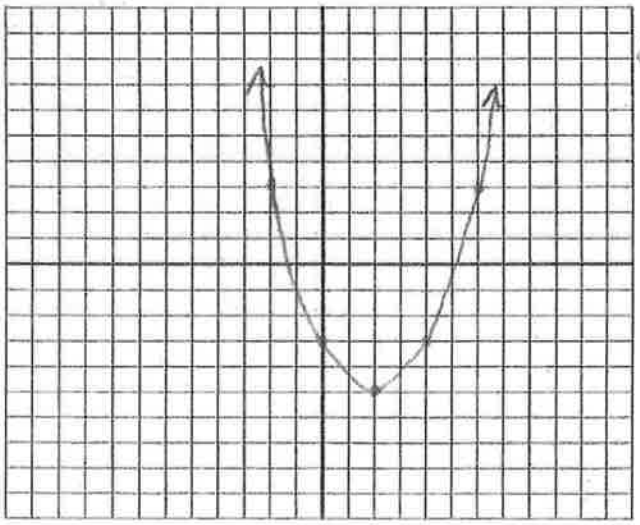

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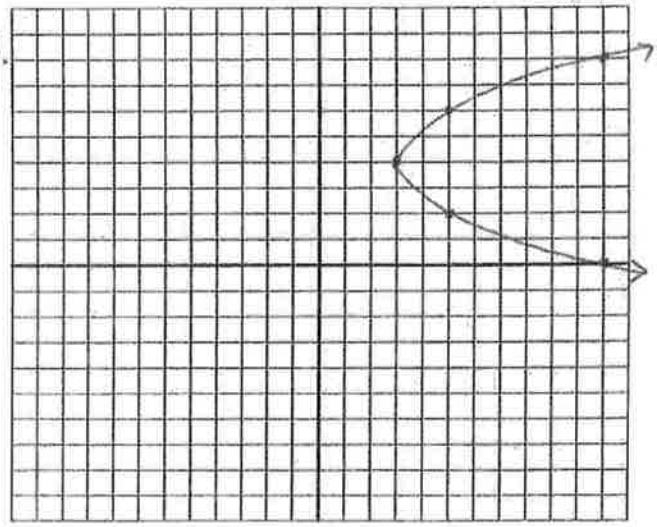

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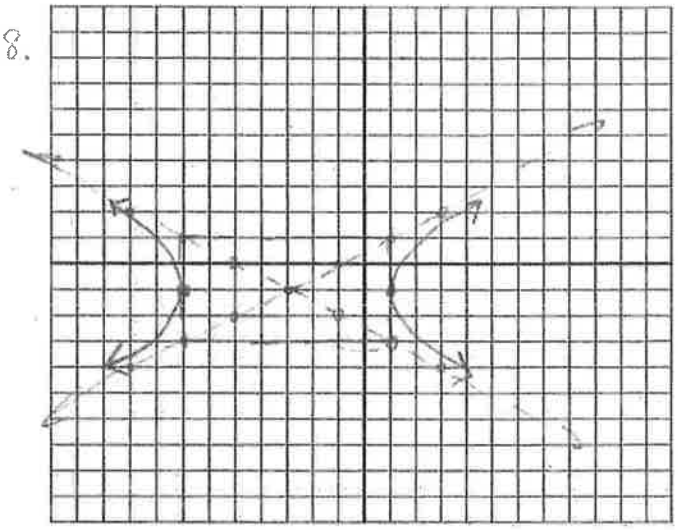

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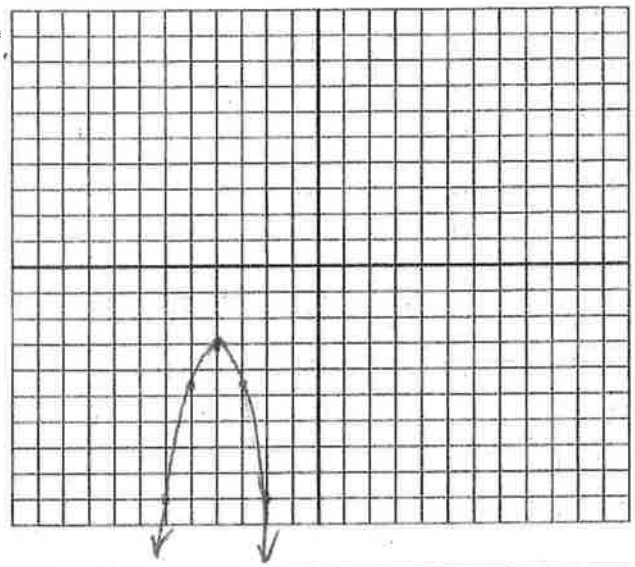

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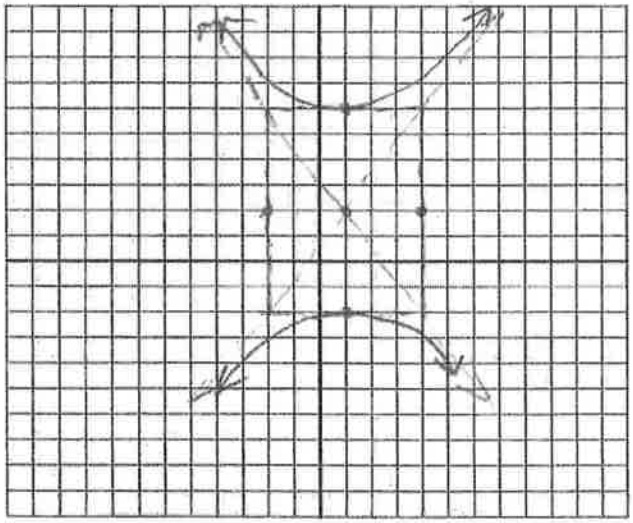

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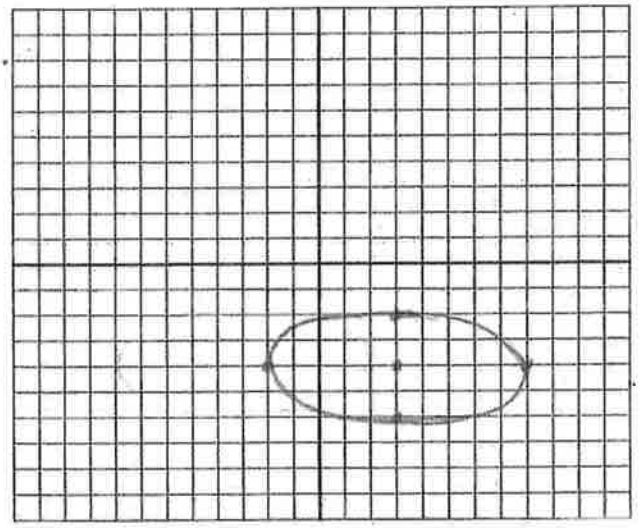

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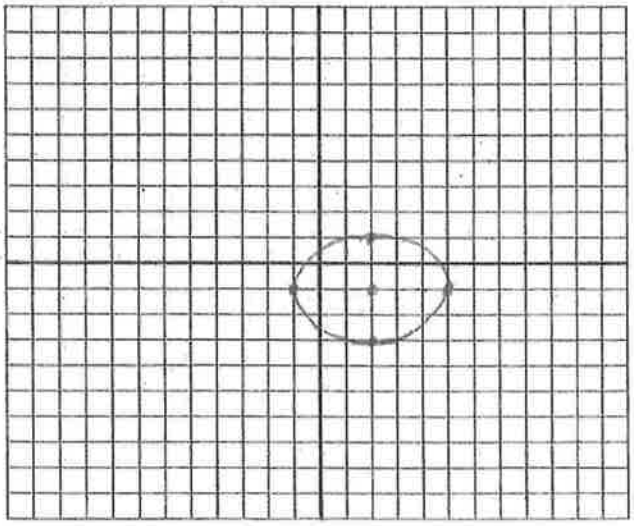

43.