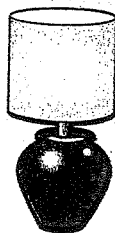


Review

3.1 1. Sketch the conic section created when a plane intersects a cone parallel to the cone's generator.



2. When the lamp is turned on, describe the conic section created by the light from it shining on a

- vertical wall
- horizontal ceiling
- slanted ceiling

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

3. centre $(2, -6)$, radius 4

4. centre $(-1, -3)$, radius $\sqrt{7}$

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

5. centre $(5, -2)$, passing through $(8, 0)$

6. centre $(-5, 6)$, passing through $(-2, 2)$

7. endpoints of a diameter at $(2, -1)$ and $(2, 5)$

8. endpoints of a diameter at $(-4, 12)$ and $(2, 0)$

Find the centre and radius of each circle.

9. $x^2 + y^2 + 9x - 8y + 4 = 0$

10. $x^2 + y^2 + 4x - 8 = 0$

Use a graphing calculator to graph each circle.

11. $(x + 3)^2 + (y - 1)^2 = 10$

12. $x^2 + y^2 - 10x + 4y + 17 = 0$

Write the equation of the image of $x^2 + y^2 = 16$ under each translation.

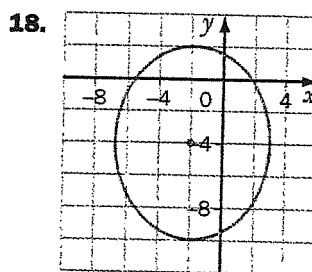
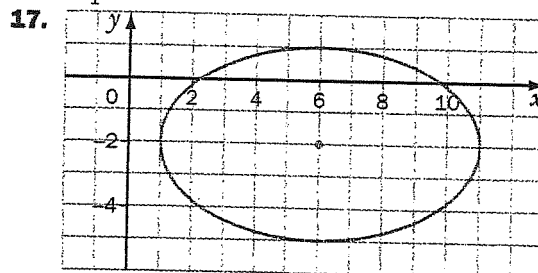
13. $(x, y) \rightarrow (x - 1, y + 3)$

14. $(x, y) \rightarrow (x + 4, y - 6)$

15. **Earthquake** An earthquake observation centre is located at $(-2, 5)$ on a kilometre grid. An earthquake epicentre is detected at a distance of 120 km from the observation centre. What is the equation of the circle that defines where the epicentre could be located?

3.4 16. Describe the difference between the equations in standard form for a circle and for an ellipse.

Find the coordinates of the centre, the lengths of the major and minor axes, and the coordinates of the foci of each ellipse.



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

20. $4x^2 + 9y^2 = 36$

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

21. foci at $(12, 0)$ and $(-12, 0)$, endpoints of minor axis at $(0, 5)$ and $(0, -5)$

22. centre $(1, -3)$, passing through $(1, -1)$, $(1, -5)$, $(2, -3)$, and $(0, -3)$

Find the coordinates of the centre, the lengths of both axes, and the coordinates of the foci of each ellipse.

23. $4x^2 + y^2 + 16x = 0$

24. $3x^2 + y^2 + 6x + 4y - 9 = 0$

Determine the equation of the image of $x^2 + 4y^2 = 9$ after each transformation.

25. translated 3 units to the left

26. translated 6 units to the right

27. stretched horizontally by a factor of 5

28. **Satellite** The first artificial Earth-orbiting satellite was *Sputnik I*, placed into elliptical orbit by the USSR in 1957. The orbit carried it to an apogee of 950 km and a perigee of 230 km. If one focus is the centre of Earth, the centre is at the origin, and the major axis is along the x -axis, find the equation for orbit. The radius of Earth is 6337 km at the equator.

Review cont

29. Describe the difference between the equations in standard form for an ellipse and for a 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

30. $\frac{y^2}{169} - \frac{x^2}{121} = 1$

31. $16(x+5)^2 - 25(y+3)^2 = 400$

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

32. centre (3, 1), one vertex (1, 1), slope of one asymptote $\frac{2}{3}$

33. foci (2, 5) and (-4, 5), transverse axis 4

Sketch the graph of each hyperbola. Then, graph the hyperbola and its asymptotes, using a graphing calculator.

34. $xy = -25$

35. $(x-4)^2 - 16(x+5) = 4$

Find the coordinates of the centre and of the vertices of the hyperbola, and the equations of the asymptotes.

36. $x^2 - y^2 - 6 = 0$

37. $25y^2 - 9x^2 - 100y - 72x - 269 = 0$

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

38. vertex at (-4, 3), focus 2 units to the right of the vertex

39. vertex at (5, -3), directrix 2 units below the vertex

40. passing through (5, 2), vertex at (4, 3), opens down

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.

41. $x^2 - 12y = -12$

42. $y^2 - 8x = 2y - 39$

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2. a) hyperbola b) circle c) ellipse

3. $(x-2)^2 + (y+6)^2 = 16$ 4. $(x+1)^2 + (y+3)^2 = 7$

5. $(x-5)^2 + (y+2)^2 = 13$; $x^2 + y^2 - 10x + 4y + 16 = 0$

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

7. $(x-2)^2 + (y-2)^2 = 9$; $x^2 + y^2 - 4x - 4y - 1 = 0$

8. $(x+1)^2 + (y-6)^2 = 45$; $x^2 + y^2 + 2x - 12y - 8 = 0$

9. $\left(-\frac{2}{9}, 4\right)$; $\sqrt{129}$ 10. (-2, 0); $2\sqrt{3}$

13. $(x+1)^2 + (y-3)^2 = 16$ 14. $(x-4)^2 + (y+6)^2 = 16$

15. $(x+2)^2 + (y-5)^2 = 14$ 400 16. Answers will vary.

17. (6, -2); (10, 6); (10, -2); (2, -2)

18. (-2, -4); (12, 10); (-2, -4 + $\sqrt{11}$), (-2, -4 - $\sqrt{11}$)

19. (2, -7); (8, 2); (2, -7 + $\sqrt{15}$), (2, -7 - $\sqrt{15}$)

20. (0, 0); (6, 4); ($\sqrt{5}$, 0), (- $\sqrt{5}$, 0)

21. $\frac{x^2}{169} + \frac{y^2}{25} = 1$; $25x^2 + 169y^2 - 4225 = 0$

22. $(x-1)^2 + (y+3)^2 = 4$; $4x^2 + y^2 - 8x + 6y + 9 = 0$

23. (-2, 0); major axis: 8, minor axis: 4; (-2, $2\sqrt{3}$),

(-2, - $2\sqrt{3}$) 24. (-1, -2); major axis: 8, minor axis:

$\frac{8}{\sqrt{3}}$; $\left(-1, -2 + \frac{4\sqrt{2}}{\sqrt{3}}\right)$, $\left(-1, -2 - \frac{4\sqrt{2}}{\sqrt{3}}\right)$

25. $(x+3)^2 + 4y^2 = 9$ 26. $(x-6)^2 + 4y^2 = 9$

27. $x^2 + 100y^2 = 225$ 28. $\frac{348100}{x^2} + \frac{218500}{y^2} = 1$

29. Answers will vary. 30. a) (0, 0) b) transverse axis: vertical, 26; conjugate axis: horizontal, 22 c) (0, ± 13)

d) $\pm \frac{11}{13}$ 31. a) (-5, -3) b) transverse axis: horizontal, 10; conjugate axis: vertical, 8 c) (0, -3), (-10, -3) d) $\pm \frac{5}{4}$

32. $(x-3)^2 - \frac{4}{(y-1)^2} = 1$; $4x^2 - 9y^2 - 24x + 18y + 11 = 0$

33. $\frac{(x+1)^2}{4} - \frac{(y-5)^2}{5} = 1$;

$5x^2 - 4y^2 + 10x + 40y - 115 = 0$

36. (0, 0); ($\pm\sqrt{6}$, 0); $x \pm y = 0$

37. (-4, 2); (-4, 5); (-4, -1); $3x - 5y + 22 = 0$,

$3x + 5y + 2 = 0$ 38. $(y-3)^2 = 8(x+4)$;

$y^2 - 8x - 6y - 23 = 0$

39. $(x-5)^2 = 8(y+3)$; $x^2 - 10x - 8y + 1 = 0$

40. $(x-4)^2 = -(y-3)$; $x^2 - 8x + y + 13 = 0$

41. focus: (0, 4); vertex: (0, 1); directrix: $y = -2$;

42. focus: (7, 6); vertex: (5, 1); directrix: $x = 3$; axis: $y = 1$; opens right.