

EOT2 MATH GUIDE

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| 1 | Solve systems of linear equations using matrices and Gaussian elimination إيجاد حل أنظمة المعادلات الخطية باستخدام المصفوفات وحذف جاوس | Exercises (22-29) | P364 |
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Solve each system of equations using Gaussian or Gauss-Jordan elimination. (Examples 4 and 5)

22. $2x = -10y + 11$
 $-8y = -9x + 23$

23. $4y + 17 = -7x$
 $8x + 5y = -19$

24. $x + 7y = 10$
 $3x + 9y = -6$

25. $7y = 9 - 5x$
 $8x = 2 - 5y$

26. $3x - 4y + 8z = 27$
 $9x - y - z = 3$
 $x + 8y - 2z = 9$

27. $x + 9y + 8z = 0$
 $5x + 8y + z = 35$
 $x - 4y - z = 17$

28. $4x + 8y - z = 10$
 $3x - 8y + 9z = 14$
 $7x + 6y + 5z = 0$

29. $2x - 10y + z = 28$
 $-5x + 11y + 7z = 18$
 $6x - y - 12z = 14$

Write the augmented matrix for each system of linear equations. (Example 2)

9. $12x - 5y = -9$
 $-3x + 8y = 10$

10. $-4x - 6y = 25$
 $7x + 2y = 16$

11. $3x - 5y + 7z = 9$
 $-10x + y + 8z = 6$
 $4x - 15z = -8$

12. $4x - z = 27$
 $-8x + 7y - 6z = -35$
 $12x - 3y + 5z = 20$

13. $w - 8x + 5y = 11$
 $7w + 2x - 3y + 9z = -5$
 $6w + 12y - 15z = 4$
 $3x + 4y - 8z = -13$

14. $14x - 2y + 3z = -22$
 $5w - 4x + 11z = -8$
 $2w - 6y + 3z = 15$
 $3w + 7x - y = 1$

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| 3 | Multiply matrices | Exercises (1-8) | P375 |
| | ضرب المصفوفات | | |

Find AB and BA , if possible. (Example 1)

1. $A = \begin{bmatrix} 8 & 1 \end{bmatrix}$

$B = \begin{bmatrix} 3 & -7 \\ -5 & 2 \end{bmatrix}$

2. $A = \begin{bmatrix} 2 & 9 \\ -7 & 3 \end{bmatrix}$

$B = \begin{bmatrix} 6 & -4 \\ 0 & 3 \end{bmatrix}$
3. $A = \begin{bmatrix} 3 & -5 \end{bmatrix}$

$B = \begin{bmatrix} 4 & 0 & -2 \\ 1 & -3 & 2 \end{bmatrix}$

4. $A = \begin{bmatrix} 4 \\ 5 \end{bmatrix}$

$B = \begin{bmatrix} 6 & 1 & -10 & 9 \end{bmatrix}$
5. $A = \begin{bmatrix} 2 \\ 5 \\ -6 \end{bmatrix}$

$B = \begin{bmatrix} 6 & 0 & -1 \\ -4 & 9 & 8 \end{bmatrix}$

6. $A = \begin{bmatrix} 2 & 0 \\ -4 & -3 \\ 1 & -2 \end{bmatrix}$

$B = \begin{bmatrix} 0 & 6 & -5 \\ 2 & -7 & 1 \end{bmatrix}$
7. $A = \begin{bmatrix} 3 & 4 \\ -7 & 1 \end{bmatrix}$

$B = \begin{bmatrix} 5 & 2 & -8 \\ -6 & 0 & 9 \end{bmatrix}$

8. $A = \begin{bmatrix} 6 & -9 & 10 \\ 4 & 3 & 8 \end{bmatrix}$

$B = \begin{bmatrix} 6 & -8 \\ 3 & -9 \\ -2 & 5 \\ 4 & 1 \end{bmatrix}$

Find A^{-1} , if it exists. If A^{-1} does not exist, write *singular*. (Example 5)

$$27. A = \begin{bmatrix} -4 & 2 \\ -6 & 3 \end{bmatrix}$$

$$28. A = \begin{bmatrix} -4 & 8 \\ 1 & -2 \end{bmatrix}$$

$$29. A = \begin{bmatrix} 3 & 5 \\ -2 & -3 \end{bmatrix}$$

$$30. A = \begin{bmatrix} 8 & 5 \\ 6 & 4 \end{bmatrix}$$

$$31. A = \begin{bmatrix} -1 & -1 & -3 \\ 3 & 6 & 4 \\ 2 & 1 & 8 \end{bmatrix}$$

$$32. A = \begin{bmatrix} 4 & 2 & 1 \\ -2 & 3 & 5 \\ 6 & -1 & -4 \end{bmatrix}$$

$$33. A = \begin{bmatrix} 5 & 2 & -1 \\ 4 & 7 & -3 \\ 1 & -5 & 2 \end{bmatrix}$$

$$34. A = \begin{bmatrix} 2 & 3 & -4 \\ 3 & 6 & -5 \\ -2 & -8 & 1 \end{bmatrix}$$

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| 5 | Find the midpoint of a segment on the coordinate plane | Exercises (1-4) | P409 |
| | إيجاد نقطة منتصف قطعة مستقيمة على المستوى الإحداثي | | |

PRECISION Find the midpoint of the line segment with endpoints at the given coordinates.

1. $(-4, 7), (3, 9)$

2. $(8, 2), (-1, -5)$

3. $(11, 6), (18, 13.5)$

4. $(-12, -2), (-10.5, -6)$

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| 6 | Find the distance between two points on the coordinate plane | Exercises (16-23) | P410 |
| | إيجاد المسافة بين نقطتين على المستوى الإحداثي | | |

Find the distance between each pair of points with the given coordinates.

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| 16. $(1, 2), (6, 3)$ | 17. $(3, -4), (0, 12)$ |
| 18. $(-6, -7), (11, -12)$ | 19. $(-10, 8), (-8, -8)$ |
| 20. $(4, 0), (5, -6)$ | 21. $(7, 9), (-2, -10)$ |
| 22. $(-4, -5), (15, 17)$ | 23. $(14, -20), (-18, 25)$ |

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| 7 | Graph parabolas | Exercises (5-8) | P417 |
| | تمثيل القطوع المكافئة بيانيًا | | |

Graph each equation.

5. $y = (x - 4)^2 - 6$

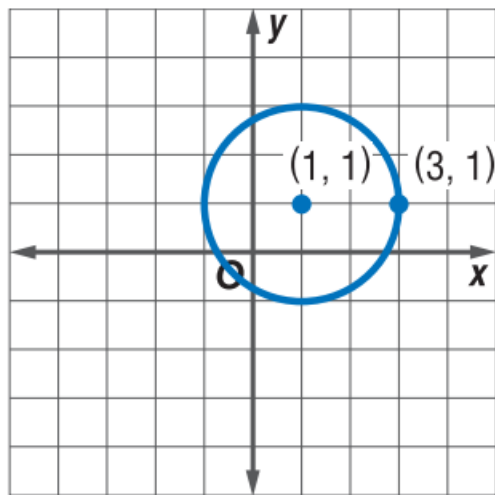
6. $y = 4(x + 5)^2 + 3$

7. $y = -3x^2 - 4x - 8$

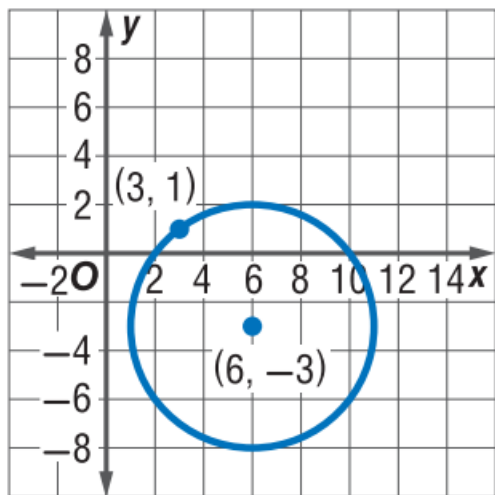
8. $x = 3y^2 - 6y + 9$

Write an equation for each graph.

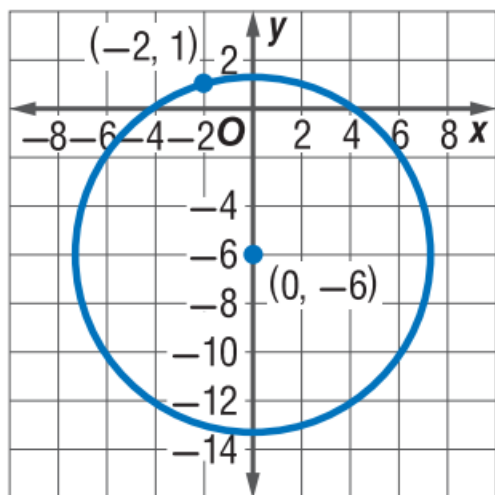
19.



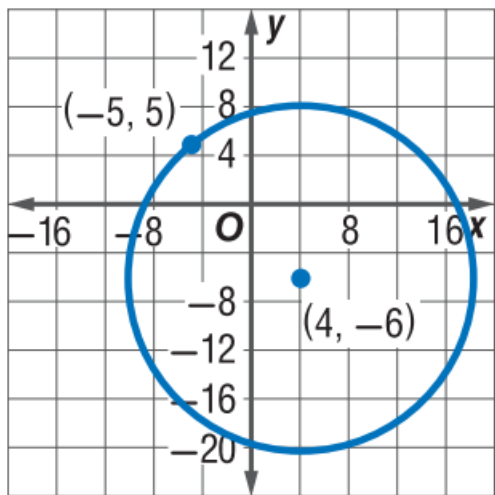
20.



21.



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| 9 | Graph circles | Exercises (39-46) | P425 |
| | تمثيل الدوائر بيانيًا | | |

Find the center and radius of each circle. Then graph the circle.

39. $x^2 + y^2 + 4x = 9$

41. $x^2 + y^2 + 2x + 4y = 9$

43. $x^2 + y^2 + 6y = -50 - 14x$

45. $2x^2 + 2y^2 - 4x + 8y = 32$

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

42. $x^2 + y^2 - 3x + 8y = 20$

44. $x^2 - 18x + 53 = 18y - y^2$

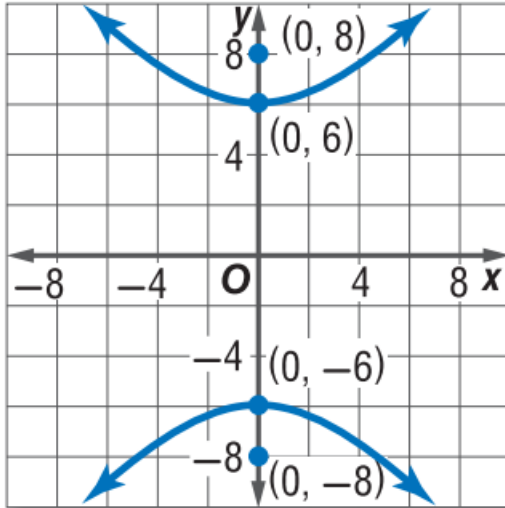
46. $3x^2 + 3y^2 - 6y + 12x = 24$

Write an equation for an ellipse that satisfies each set of conditions.

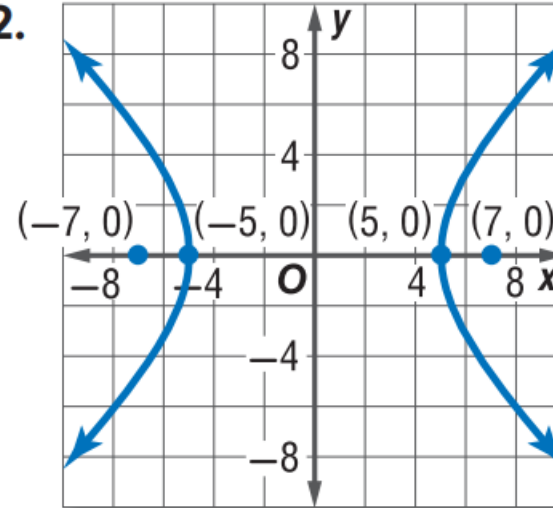
- 17.** vertices at $(-6, 4)$ and $(12, 4)$, co-vertices at $(3, 12)$ and $(3, -4)$
- 18.** vertices at $(-1, 11)$ and $(-1, 1)$, co-vertices at $(-4, 6)$ and $(2, 6)$
- 19.** center at $(-2, 6)$, vertex at $(-2, 16)$, co-vertex at $(1, 6)$
- 20.** center at $(3, -4)$, vertex at $(8, -4)$, co-vertex at $(3, -2)$
- 21.** vertices at $(4, 12)$ and $(4, -4)$, co-vertices at $(1, 4)$ and $(7, 4)$
- 22.** vertices at $(-11, 2)$ and $(-1, 2)$, co-vertices at $(-6, 0)$ and $(-6, 4)$

Write an equation for each hyperbola.

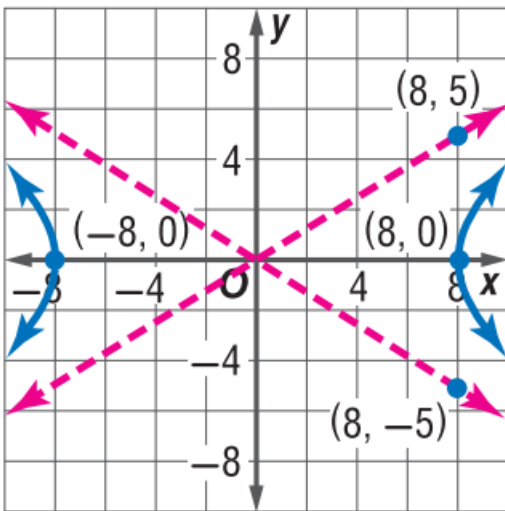
1.



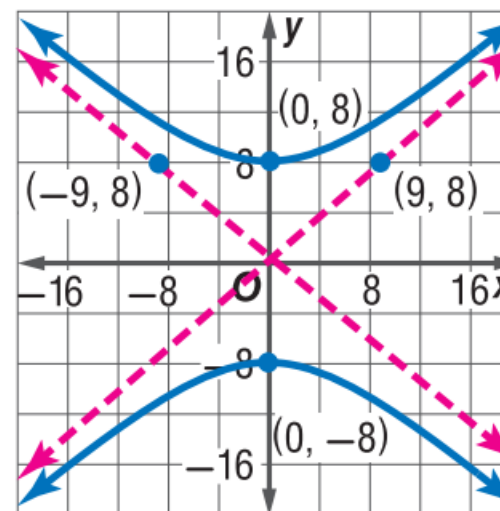
2.



3.



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| 12 | Identify conic sections from their equations | Exercises (24-33) | P448 |
| | تحديد القطوع المخروطية من معادلاتها | | |

Without writing in standard form, state whether the graph of each equation is a *parabola*, *circle*, *ellipse*, or *hyperbola*.

24. $4x^2 - 5y = 9x - 12$

26. $9x^2 + 12y = 9y^2 + 18y - 16$

28. $12y^2 - 4xy + 9x^2 = 18x - 124$

30. $19x^2 + 14y = 6x - 19y^2 - 88$

32. $5x - 12xy + 6x^2 = 8y^2 - 24y - 9$

25. $4x^2 - 12x = 18y - 4y^2$

27. $18x^2 - 16y = 12x - 4y^2 + 19$

29. $5xy + 12x^2 - 16x = 5y + 3y^2 + 18$

31. $8x^2 + 20xy + 18 = 4y^2 - 12 + 9x$

33. $18x - 24y + 324xy = 27x^2 + 3y^2 - 5$

Real-World Example 6 Resolve a Force into Rectangular Components

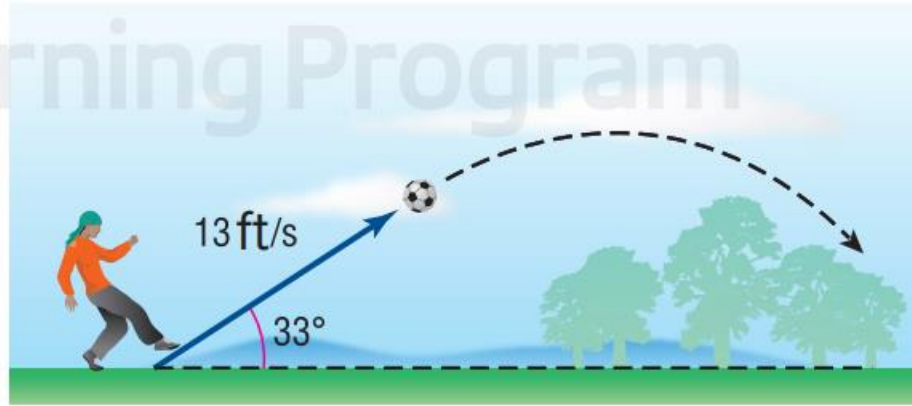
LAWN CARE Eiman is pushing the handle of a lawn mower with a force of 450 newtons at an angle of 56° with the ground.

- a. Draw a diagram that shows the resolution of the force that Eiman exerts into its rectangular components.



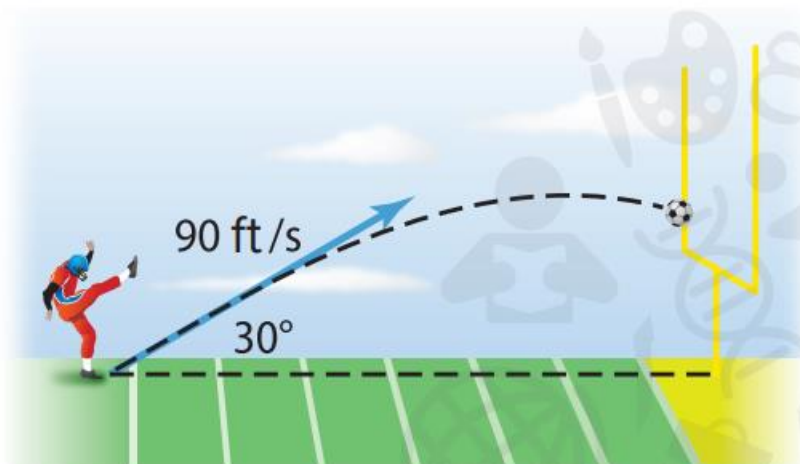
- b. Find the magnitudes of the horizontal and vertical components of the force.

6. **SOCCER** A player kicks a football so that it leaves the ground with a velocity of 44 feet per second at an angle of 33° with the ground.



- A. Draw a diagram that shows the resolution of this force into its rectangular components.
- B. Find the magnitude of the horizontal and vertical components of the velocity.

42. **SOCCER** For a field goal attempt, a ball is kicked with the velocity shown in the diagram below



- Draw a diagram that shows the resolution of this force into its rectangular components.
- Find the magnitudes of the horizontal and vertical components. (Example 6)

43. **CLEANING** Buthaina is pushing the handle of a push broom with a force of 190 newtons at an angle of 33° with the ground. (Example 6)



- Draw a diagram that shows the resolution of this force into its rectangular components.
- Find the magnitudes of the horizontal and vertical components.

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| 14 | Represent and operate with vectors in the coordinate plane. | Exercises (1-10) | P495 |
| | تمثيل وإجراء العمليات على المتجهات في المستوى الإحداثي. | | |

Find the component form and magnitude of \overrightarrow{AB} with the given initial and terminal points. (Examples 1 and 2)

1. $A(-3, 1), B(4, 5)$

2. $A(2, -7), B(-6, 9)$
3. $A(10, -2), B(3, -5)$

4. $A(-2, 7), B(-9, -1)$
5. $A(-5, -4), B(8, -2)$

6. $A(-2, 6), B(1, 10)$
7. $A(2.5, -3), B(-4, 1.5)$

8. $A(-4.3, 1.8), B(9.4, -6.2)$
9. $A\left(\frac{1}{2}, -9\right), B\left(6, \frac{5}{2}\right)$

10. $A\left(\frac{3}{5}, -\frac{2}{5}\right), B(-1, 7)$

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| 15 | the dot product of two vectors and use the dot product to find the angle between إيجاد ناتج الضرب النقطي لمتجهين، واستخدام ناتج الضرب النقطي لإيجاد الزاوية بينهما | Exercises (10-15) | P504 |
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Use the dot product to find the magnitude of the given vector. (Example 2)

10. $\mathbf{m} = \langle -3, 11 \rangle$

11. $\mathbf{r} = \langle -9, -4 \rangle$

12. $\mathbf{n} = \langle 6, 12 \rangle$

13. $\mathbf{v} = \langle 1, -18 \rangle$

14. $\mathbf{p} = \langle -7, -2 \rangle$

15. $\mathbf{t} = \langle 23, -16 \rangle$

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| 16 | Solve systems of linear equations using Cramer's Rule | Exercises (11-21) | P384 |
| | حل أنظمة المعادلات الخطية باستخدام قاعدة كرامر | | |

Use Cramer's Rule to find the solution of each system of linear equations, if a unique solution exists. (Examples 3 and 4)

11. $-3x + y = 4$
 $2x + y = -6$

12. $2x + 3y = 4$
 $5x + 6y = 5$

13. $5x + 4y = 7$
 $-x - 4y = -3$

14. $4x + \frac{1}{3}y = 8$
 $3x + y = 6$

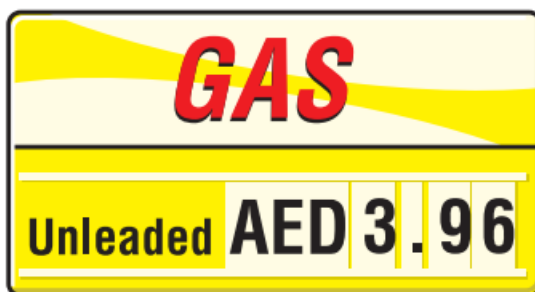
15. $2x - y + z = 1$
 $x + 2y - 4z = 3$
 $4x + 3y - 7z = -8$

16. $x + y + z = 12$
 $6x - 2y - z = 16$
 $3x + 4y + 2z = 28$

17. $x + 2y = 12$
 $3y - 4z = 25$
 $x + 6y + z = 20$

18. $9x + 7y = -30$
 $8y + 5z = 11$
 $-3x + 10z = 73$

19. **ROAD TRIP** Maysoon stopped for gasoline twice during a road trip. The price of gasoline at each station is shown below. She bought a total of 33.5 liters and spent AED 134.28. Use Cramer's Rule to determine the number of liters of gasoline Maysoon bought for AED 3.96 a liter. (Example 3)



- 20. GROUP PLANNING** A class reunion committee is planning for 400 guests for its 10-year reunion. The guests can choose one of the three options for dessert that are shown below. The chef preparing the desserts must spend 5 minutes on each pie, 8 minutes on each trifle, and 12 minutes on each cheesecake. The total cost of the desserts was AED1170, and the chef spends exactly 45 hours preparing them. Use Cramer's Rule to determine how many servings of each dessert were prepared. (Example 4)

Blueberry Pie



AED 3.00

Chocolate Trifle



AED 2.50

Cherry Cheesecake



AED 4.00

21

PHONES

Maha, Eiman and Maysa all went over their allotted phone plans. For an extra 30 minutes of gaming, 12 minutes of calls, and 40 text messages, Maha paid AED 52.90. Eiman paid AED 48.07 for 18 minutes of gaming, 15 minutes of calls, and 55 text messages. Maysa only paid AED 13.64 for 6 minutes of gaming and 7 minutes of calls. If they all have the same plan, find the cost of each service. (Example 4)

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| 17 | Graph parabolas | Exercises (9-12) | P417 |
| | تمثيل القطوع المكافئة بيانيًا | | |

Write an equation for each parabola described below. Then graph the equation.

- 9.** vertex $(0, 2)$, focus $(0, 4)$

10. vertex $(-2, 4)$, directrix $x = -1$
- 11.** focus $(3, 2)$, directrix $y = 8$

12. vertex $(-1, -5)$, focus $(-5, -5)$

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| 18 | Graph hyperbolas | Exercises (14-19) | P443 |
| | تمثيل القطوع الزائدة بيانياً | | |

Graph each hyperbola. Identify the vertices, foci, and asymptotes.

14. $\frac{x^2}{36} - \frac{y^2}{4} = 1$

15. $\frac{y^2}{9} - \frac{x^2}{49} = 1$

16. $\frac{y^2}{36} - \frac{x^2}{25} = 1$

17. $\frac{x^2}{16} - \frac{y^2}{16} = 1$

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

19. $\frac{(y + 5)^2}{16} - \frac{(x + 2)^2}{36} = 1$

Find a unit vector \mathbf{u} with the same direction as \mathbf{v} . (Example 4)

20. $\mathbf{v} = \langle -2, 7 \rangle$

21. $\mathbf{v} = \langle 9, -3 \rangle$

22. $\mathbf{v} = \langle -8, -5 \rangle$

23. $\mathbf{v} = \langle 6, 3 \rangle$

24. $\mathbf{v} = \langle -2, 9 \rangle$

25. $\mathbf{v} = \langle -1, -5 \rangle$

26. $\mathbf{v} = \langle 1, 7 \rangle$

27. $\mathbf{v} = \langle 3, -4 \rangle$

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| 20 | the dot product of two vectors and use the dot product to find the angle between إيجاد ناتج الضرب النقطي لمتجهين، واستخدام ناتج الضرب النقطي لإيجاد الزاوية بينهما | Exercises (16-23) | P504 |
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Find the angle θ between \mathbf{u} and \mathbf{v} to the nearest tenth of a degree. (Example 3)

16. $\mathbf{u} = \langle 0, -5 \rangle, \mathbf{v} = \langle 1, -4 \rangle$

17. $\mathbf{u} = \langle 7, 10 \rangle, \mathbf{v} = \langle 4, -4 \rangle$

18. $\mathbf{u} = \langle -2, 4 \rangle, \mathbf{v} = \langle 2, -10 \rangle$

19. $\mathbf{u} = -2\mathbf{i} + 3\mathbf{j}, \mathbf{v} = -4\mathbf{i} - 2\mathbf{j}$

20. $\mathbf{u} = \langle -9, 0 \rangle, \mathbf{v} = \langle -1, -1 \rangle$

21. $\mathbf{u} = -\mathbf{i} - 3\mathbf{j}, \mathbf{v} = -7\mathbf{i} - 3\mathbf{j}$

22. $\mathbf{u} = \langle 6, 0 \rangle, \mathbf{v} = \langle -10, 8 \rangle$

23. $\mathbf{u} = -10\mathbf{i} + \mathbf{j}, \mathbf{v} = 10\mathbf{i} - 5\mathbf{j}$

