

In Exercises 41–48, solve the system of quadratic equations algebraically by the method of elimination. Then verify your results by using a graphing utility to graph the equations and find any points of intersection of the graphs.

41.
$$\begin{cases} -x^2 + y^2 + 4x - 6y + 4 = 0 \\ x^2 + y^2 - 4x - 6y + 12 = 0 \end{cases}$$
42.
$$\begin{cases} -x^2 - y^2 - 8x + 20y - 7 = 0 \\ x^2 + 9y^2 + 8x + 4y + 7 = 0 \end{cases}$$
43.
$$\begin{cases} -4x^2 - y^2 - 16x + 24y - 16 = 0 \\ 4x^2 + y^2 + 40x - 24y + 208 = 0 \end{cases}$$
44.
$$\begin{cases} x^2 - 4y^2 - 20x - 64y - 172 = 0 \\ 16x^2 + 4y^2 - 320x + 64y + 1600 = 0 \end{cases}$$
45.
$$\begin{cases} x^2 - y^2 - 12x + 16y - 64 = 0 \\ x^2 + y^2 - 12x - 16y + 64 = 0 \end{cases}$$
46.
$$\begin{cases} x^2 + 4y^2 - 2x - 8y + 1 = 0 \\ -x^2 + 2x - 4y - 1 = 0 \end{cases}$$
47.
$$\begin{cases} -16x^2 - y^2 + 24y - 80 = 0 \\ 16x^2 + 25y^2 - 400 = 0 \end{cases}$$
48.
$$\begin{cases} 16x^2 - y^2 + 16y - 128 = 0 \\ y^2 - 48x - 16y - 32 = 0 \end{cases}$$

In Exercises 49–54, solve the system of quadratic equations algebraically by the method of substitution. Then verify your results by using a graphing utility to graph the equations and find any points of intersection of the graphs.

49.
$$\begin{cases} x^2 + y^2 - 4 = 0 \\ 3x - y^2 = 0 \end{cases}$$
50.
$$\begin{cases} 4x^2 + 9y^2 - 36y = 0 \\ x^2 + 9y - 27 = 0 \end{cases}$$
51.
$$\begin{cases} x^2 + 2y^2 - 4x + 6y - 5 = 0 \\ -x + y - 4 = 0 \end{cases}$$
52.
$$\begin{cases} x^2 + 2y^2 - 4x + 6y - 5 = 0 \\ x^2 - 4x - y + 4 = 0 \end{cases}$$
53.
$$\begin{cases} xy + x - 2y + 3 = 0 \\ x^2 + 4y^2 - 9 = 0 \end{cases}$$
54.
$$\begin{cases} 5x^2 - 2xy + 5y^2 - 12 = 0 \\ x + y - 1 = 0 \end{cases}$$

Synthesis

True or False? In Exercises 55 and 56, determine whether the statement is true or false. Justify your answer.

55. The graph of $x^2 + xy + ky^2 + 6x + 10 = 0$, where k is any constant less than $\frac{1}{4}$, is a hyperbola.
56. After using a rotation of axes to eliminate the xy -term from an equation of the form $Ax^2 + Bxy + Cy^2 + Dx + Ey + F = 0$ the coefficients of the x^2 - and y^2 -terms remain A and B , respectively.
57. Show that the equation $x^2 + y^2 = r^2$ is invariant under rotation of axes.
58. Find the lengths of the major and minor axes of the ellipse in Exercise 10.

Review

In Exercises 59–62, sketch the graph of the rational function. Identify all intercepts and asymptotes.

59. $g(x) = \frac{2}{2-x}$ 60. $f(x) = \frac{2x}{2-x}$
61. $h(t) = \frac{t^2}{2-t}$ 62. $g(s) = \frac{2}{4-s^2}$

In Exercises 63–66, find (a) AB , (b) BA , and, if possible, (c) A^2 .

63. $A = \begin{bmatrix} 1 & -3 \\ 2 & 5 \end{bmatrix}, B = \begin{bmatrix} 0 & 6 \\ 5 & -1 \end{bmatrix}$
64. $A = \begin{bmatrix} 1 & 5 \\ 0 & -2 \end{bmatrix}, B = \begin{bmatrix} 3 & 2 \\ -3 & 8 \end{bmatrix}$
65. $A = [4 \quad -2 \quad 5], B = \begin{bmatrix} 3 \\ -4 \\ 5 \end{bmatrix}$
66. $A = \begin{bmatrix} 0 & -2 & 0 \\ 1 & 1 & 5 \\ 3 & 4 & 0 \end{bmatrix}, B = \begin{bmatrix} 1 & 0 & -3 \\ -4 & 5 & -1 \\ 6 & 3 & 2 \end{bmatrix}$

In Exercises 67–70, find the coefficient a of the given term in the expansion of the binomial.

- | <i>Binomial</i> | <i>Term</i> |
|---------------------|-------------|
| 67. $(x + 8)^7$ | ax^2 |
| 68. $(3x - y)^6$ | ax^3y^3 |
| 69. $(x - 4y)^{10}$ | ax^6y^4 |
| 70. $(3x + 2y)^8$ | ax^2y^6 |