For the following conic sections, a) name the figure, b) put equation in standard form, c) sketch the graph, labeling any pertinent information (center, vertex, axis of symmetry, intercepts, etc.)

1. \[ 2x^2 - 4x + 2y^2 + 8y - 12 = 0 \]

2. \[ x - 3y^2 - 12y = 3 \]

3. Given that \[ f(x) = \begin{cases} 
1, & x < -2 \\
-x + 3, & x \geq 2 
\end{cases}, \]

   Find the following:
   a) \( f(0) \)
   b) \( f(-10) \)
   c) \( f(23) \)
   d) domain of \( f \)
   e) sketch its graph
   f) range of \( f \)

4. Given that \( f(x) = 2 \left[ x + 3 \right] - 1 \). Give its domain, range, and sketch its graph.

Solve each of the following system of equations by graphing

5. \[ \begin{align*} 
2x + y &= 5 \\
x - 2y &= 0 
\end{align*} \]

6. \[ \begin{align*} 
x &= 3 - 2y \\
2x + 4y &= 6 
\end{align*} \]

7. \[ \begin{align*} 
3x &= 5 - 2y \\
x &= 3 + 2y 
\end{align*} \]

Solve each of the following systems of equations by substitution, if possible.

8. \[ \begin{align*} 
2x - y &= -21 \\
4x + 5y &= 7 
\end{align*} \]

9. \[ \begin{align*} 
x &= -2 - 3y \\
-2x - 6y &= 4 
\end{align*} \]

10. \[ \begin{align*} 
\frac{3}{2} x + 2 &= y \\
0.6x - 0.4y &= -0.4 
\end{align*} \]

Solve each of the following systems of equations by elimination, if possible.

11. \[ \begin{align*} 
2x + 5y &= -3 \\
x + \frac{5}{4}y &= -1 \end{align*} \]

12. \[ \begin{align*} 
6x - 4y &= 6 \\
-3x + 2y &= 3 
\end{align*} \]

13. \[ \begin{align*} 
x^2 + y^2 &= 9 \\
y &= 3 - x^2 
\end{align*} \]

Solve the following problems by defining two variables, setting up a system of equations, and then solve.

14. A retired couple invested part of $12,000 at 6% interest and the rest at 7%. If their annual income from these two investments is $810, how much was invested at each rate?

15. A delivery truck travels 50 miles in the same time that a cargo plane travels 180 miles. The speed of the plane is 143 miles per hour faster than the speed of the truck. Find the speed of the delivery truck.

16. How many ounces of an 8% alcohol solution and how many ounces of a 15% alcohol solution must be mixed together to obtain 100 ounces of a 12.2% alcohol solution?
17. Evaluate the following:
   \[ a) \sum_{k=1}^{4} \left(k^2 + k - 2\right) \quad b) \sum_{k=0}^{3} (-1)^k \left(\frac{k}{k+1}\right) \]

18. Graph the solution set of the following systems of inequalities:
   a) \[ \begin{cases} 4x + 2y < 8 \\ x \geq 0 \\ y \geq 0 \end{cases} \]
   b) \[ \begin{cases} x \geq y^2 \\ y > 2x - 4 \end{cases} \]

Answers:
1. circle; center at \((1, -2)\); radius \(\sqrt{11}\)
2. parabola opening right; vertex \((-9, -2)\); axis of symmetry at \(y = -2\)
3. a) 0  b) 1  c) -20  d) \((-\infty, +\infty)\)
4. domain: \((-\infty, +\infty)\); range: \{odd integers\}
   “step” function shifted 3 left, vertically stretched by factor of 2, down 1
5. \((2,1)\)
6. infinitely many solutions
7. no solution
8. \((-7, 7)\)
9. infinitely many solutions
10. no solution
11. \(\left(\frac{1}{2}, \frac{4}{5}\right)\)
12. no solution
13. \((0,3), \left(\sqrt{5}, -2\right), \left(-\sqrt{5}, -2\right)\)
14. $3,000 at 6%; $9,000 at 7%
15. 55 mph
16. 40 ounces of 80% solution; 60 ounces of 15% solution
17. a) 32  b) \(-\frac{7}{12}\)
18. a)  
   b)