Systems of Two Equations

Exercises

1. Graph the solution set to the equation $2x - 3y = 1$
2. Graph the solution set to the system $2x - 3y = 1, x + y = -1$
3. How many solutions are there to the system $2x - 3y = 1, x + y = -1, x - y = 2$?
4. Graph the straight lines which make up the system
   $\begin{align*}
   x + y &= 5 \\
   2x - 3y &= 1 \\
   x - y &= 2
   \end{align*}$

   and from your graph determine the solution set.
5. Find a system of two equations in two unknowns for which $(2, -3)$ is a solution.
6. Use the method of substitution to solve the system
   $\begin{align*}
   x + y &= 6 \\
   2x - y &= 5
   \end{align*}$
7. Solve the system
   $\begin{align*}
   5x - 4y &= 9 \\
   4x + y &= 7
   \end{align*}$
8. Solve the system
   $\begin{align*}
   x + y &= 5 \\
   3x - 2y &= 12 \\
   2x - 3y &= 7
   \end{align*}$
9. Use the method of elimination to solve the system
   $\begin{align*}
   2x - y &= 5 \\
   x + 7y &= 4
   \end{align*}$
10. If $(3, -4)$ is a solution to the equation $ax - 5y = -2$, what must $a$ equal?
11. Suppose that $(-2, 5)$ and $(1, 1)$ solve the equation $ax + by = 1$. What do $a$ and $b$ equal?
12. Suppose that a population of bacteria satisfies and exponential growth law, $p(t) = ae^{kt}$. If $p(1) = 18$ and $p(5) = 72$, determine $a$ and $k$.
13. Use the method of elimination to solve the system $3x - 4y = 5, x + 7y = 1$.
14. Tickets to see Star Wars 18 at a local movie theater cost $25 for an adult and $15 for a child. If the theater takes in $1300, and sold a total of 70 tickets, how many child and adult tickets were sold?
15. A research chemist has two different salt water solutions. Solution 1 is 5% salt and solution 2 is 15% salt. She wants to have 1 liter of a 7% solution. How much of each solution should she mix together to get the desired solution?
16. Suppose a boat has to make a round trip up and down a river. The trip up takes 1 hour and is with the current. The trip back takes 3 hours. Suppose the round trip is a total of 20 miles, and that the boat’s speed and the speed of the current are constant. What is the boat’s speed, and what is the current’s speed?
17. What is the augmented matrix for the system
   $\begin{align*}
   x + y &= 5 \\
   13x - 45y &= 19
   \end{align*}$
18. What system has the following augmented matrix
\[
\begin{bmatrix}
-2 & 3 & 5 \\
1 & -1 & 2
\end{bmatrix}
\]

19. A system of equations has \((1, 2)\) as a solution and
\[
\begin{bmatrix}
-2 & 3 \\
1 & 1
\end{bmatrix}
\]
as its coefficient matrix. What is the system of equations?

20. What are the coefficient matrix and augmented matrices for the system
\[
\begin{align*}
x_1 - x_2 + 5x_3 &= 0 \\
-2x_1 + 5x_2 - 8x_3 &= 7
\end{align*}
\]

21. For what system of equations is the matrix below the augmented matrix?
\[
\begin{bmatrix}
-1 & 1 & -1 & 5 \\
5 & 7 & 3 & 1
\end{bmatrix}
\]

22. Suppose the matrix below is the coefficient matrix of a system of linear equations. How many equations and variables in the system?
\[
\begin{bmatrix}
9 & 0 & 3 & -1 \\
0 & -8 & 4 & 11 \\
15 & 12 & -7 & 17
\end{bmatrix}
\]

23. Use Gaussian elimination to solve the system
\[
\begin{align*}
x + 2y &= 3 \\
3x + 8y &= 12
\end{align*}
\]

24. Use Gaussian elimination to solve the system
\[
\begin{align*}
x - y &= 17 \\
5x + 9y &= 1
\end{align*}
\]

25. Use Gaussian elimination to solve the system
\[
\begin{align*}
12x - 6y &= 18 \\
-2x + y &= 5
\end{align*}
\]

26. The following system contains a parameter \(a\). Solve for \(x\) and \(y\) in terms of this parameter.
\[
\begin{align*}
x - 2y &= a \\
ax + y &= 2
\end{align*}
\]