Get Ready for Linear Systems

Read each worked example, then try the questions that follow it. Show all your work on your own paper. You will need grid paper for questions 5 to 8.

Substitute and Evaluate

Evaluate $3x - 2y + 1$ when $x = 4$ and $y = -3$.

$$\begin{aligned} & 3x - 2y + 1 \\ &= 3(4) - 2(-3) + 1 \\ &= 12 + 6 + 1 \\ &= 19 \end{aligned}$$

1. Evaluate each expression when $x = -2$ and $y = 3$.

a) $3x + 4y$ b) $2x - 3y + 5$ c) $4x - y$

d) $-x - 2y$ e) $\frac{1}{2}x + y$ f) $\frac{2}{3}y - \frac{1}{2}x$

2. Evaluate each expression when $a = 4$ and $b = -1$.

a) $a + b - 3$ b) $-2a - 3b + 7$ c) $3b - 5 + a$

d) $1 + 2a - 3b$ e) $\frac{3}{4}a + b$ f) $b - \frac{1}{2}a$

Simplify Expressions

Simplify $3(x + y) - 2(x - y)$.

$$\begin{aligned} & 3(x + y) - 2(x - y) && \text{Use the distributive property to expand.} \\ &= 3(x) + 3(y) - 2(x) - 2(-y) \\ &= 3x + 3y - 2x + 2y && \text{Collect like terms.} \\ &= x + 5y \end{aligned}$$

3. Simplify.

a) $5x + 2(x - y)$ b) $3a - 2b + 4a - 9b$ c) $2(x - y) + 3(x - y)$

4. Simplify.

a) $5(2x + 3y) - 4(3x - 5y)$

b) $x - 2(x + 3y) - (2x + 3y) - 4(x + y)$

c) $3(a + 2b - 2) - 2(2a - 5b - 1)$

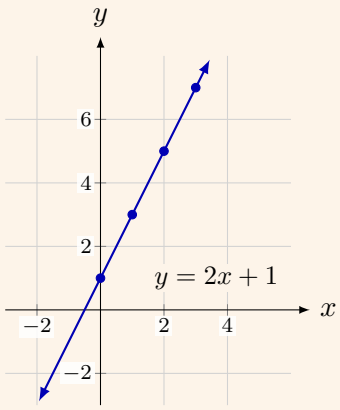
Graph Lines — Method 1: Use a Table of Values

Graph the line $y = 2x + 1$.

Choose simple values for x. Calculate each corresponding value for y.

x	y
0	1
1	3
2	5
3	7

Plot the points. Draw a line through the points.



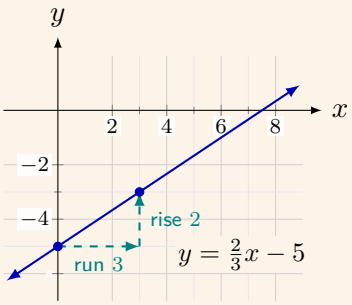
Graph Lines — Method 2: Use the Slope and the y-Intercept

Graph the line $y = \frac{2}{3}x - 5$.

The equation is in the form $y = mx + b$. The slope, m, is $\frac{2}{3}$. So, $\frac{\text{rise}}{\text{run}} = \frac{2}{3}$.

The y-intercept, b, is -5. So, a point on the line is $(0, -5)$.

Start on the y-axis at $(0, -5)$. Then, use the slope to reach another point on the line: run 3 to the right, then rise 2 up.



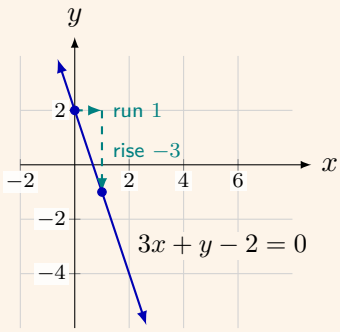
Graph the line $3x + y - 2 = 0$.

First, rearrange the equation to write it in the form $y = mx + b$.

$$3x + y - 2 = 0$$
$$y = -3x + 2$$

The slope is -3, so $\frac{\text{rise}}{\text{run}} = \frac{-3}{1}$. The y-intercept is 2.

Use these facts to graph the line: start at $(0, 2)$, run 1 to the right, then go down 3.



Graph Lines — Method 3: Use Intercepts

Graph the line $3x - 4y = 12$.

At the x-intercept, $y = 0$.

$$\begin{aligned} 3x - 4(0) &= 12 \\ 3x &= 12 \\ x &= 4 \end{aligned}$$

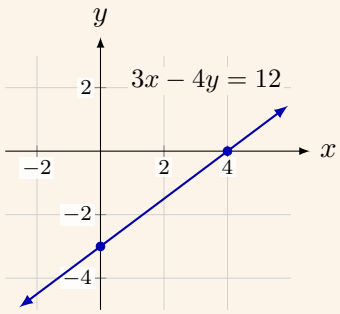
The x-intercept is 4. A point on the line is $(4, 0)$.

At the y-intercept, $x = 0$.

$$\begin{aligned} 3(0) - 4y &= 12 \\ -4y &= 12 \\ y &= -3 \end{aligned}$$

The y-intercept is -3. A point on the line is $(0, -3)$.

Plot both intercepts. Draw a line through them.



For questions 5 to 8: draw *one* large set of axes for each question. Graph all four parts (a, b, c and d) of that question on the same set of axes.

5. Graph each line. Use a table of values or the slope and y-intercept method.

a) $y = x + 2$

b) $y = 2x + 3$

c) $y = \frac{1}{2}x - 5$

d) $y = -\frac{2}{5}x + 6$

6. Graph each line by first rewriting the equation in the form $y = mx + b$.

a) $x - y + 1 = 0$

b) $2x + y - 3 = 0$

c) $-x - y + 7 = 0$

d) $5x + 2y + 2 = 0$

7. Graph each line by finding the intercepts.

a) $x + y = 3$

b) $5x - 3y = 15$

c) $7x - 3y = 21$

d) $4x - 8y = 16$

8. Graph each line. Choose a convenient method.

a) $-x - y - 1 = 0$

b) $2x - 5y = 20$

c) $2x + 3y + 6 = 0$

d) $y = \frac{3}{4}x - 1$

Percent

Calculate the amount of salt in 10 kg of a 25% salt solution.

25% means $\frac{25}{100}$ or 0.25.

$$\begin{aligned} 25\% \text{ of } 10 \text{ kg} &= 0.25 \times 10 \text{ kg} \\ &= 2.5 \text{ kg} \end{aligned}$$

The solution contains 2.5 kg of salt.

How much simple interest is earned in 1 year on \$1000 invested at 5%/year?

$$\begin{aligned} \text{Interest} &= \$1000 \times 0.05 \\ &= \$50 \end{aligned}$$

In 1 year, \$50 interest is earned.

9. Calculate each amount.

a) the volume of pure antifreeze in 12 L of a 35% antifreeze solution

b) the mass of pure gold in 3 kg of a 24% gold alloy

c) the mass of silver in 400 g of an 11% silver alloy

10. Find the simple interest earned after 1 year on each investment.

a) \$2000 invested at 4%/year

b) \$1200 invested at 2.9%/year

c) \$1500 invested at 3.1%/year

d) \$12 500 invested at 4.5%/year

Get Ready for Linear Systems — Final Answers

Final answers only. Equivalent forms are fine (for example, $y = -\frac{5}{2}x - 1$ or $y = -2.5x - 1$).

Substitute and evaluate

1. a) 6 b) -8 c) -11
d) -4 e) 2 f) 3

2. a) 0 b) 2 c) -4
d) 12 e) 2 f) -3

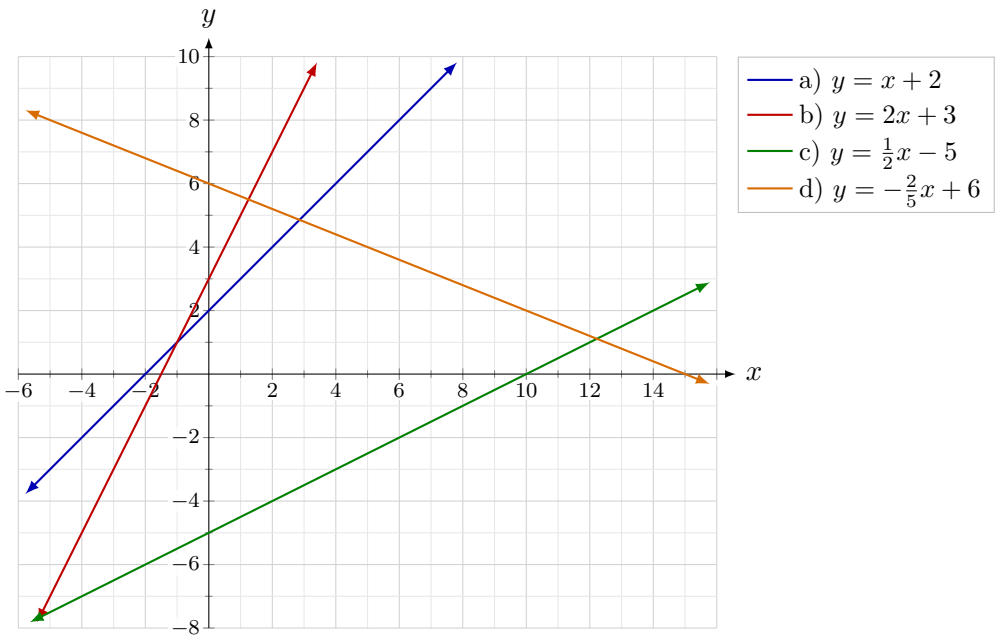
Simplify expressions

3. a) $7x - 2y$ b) $7a - 11b$ c) $5x - 5y$

4. a) $-2x + 35y$ b) $-7x - 13y$ c) $-a + 16b - 4$

Graph lines

5. All four lines on one set of axes:

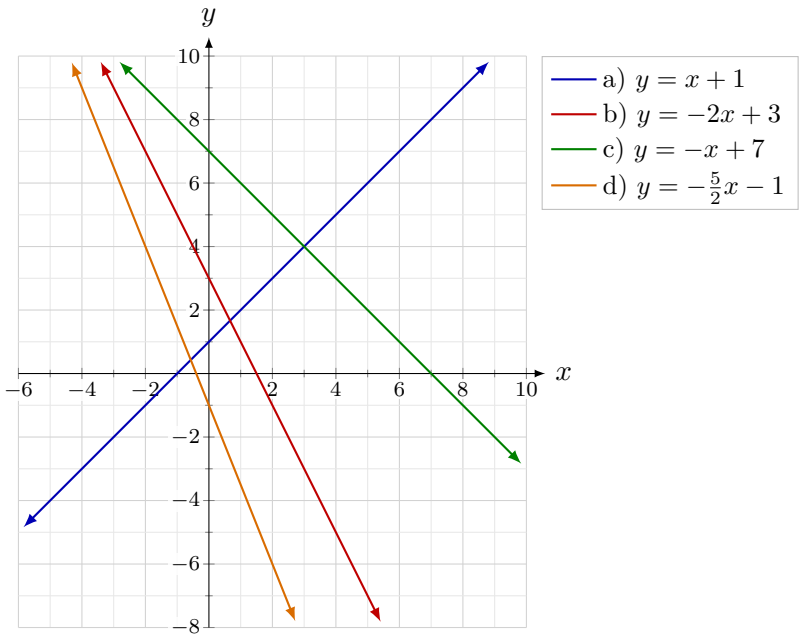


6. a) $y = x + 1$

b) $y = -2x + 3$

c) $y = -x + 7$

d) $y = -\frac{5}{2}x - 1$

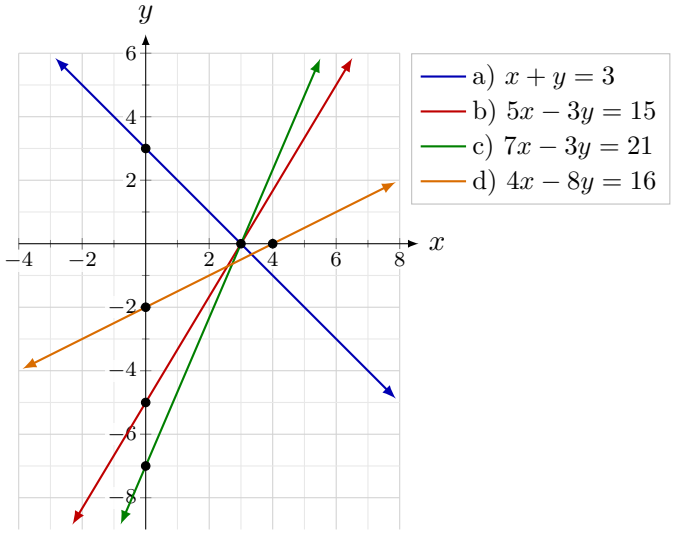


7. a) x-intercept 3, y-intercept 3

b) x-intercept 3, y-intercept -5

c) x-intercept 3, y-intercept -7

d) x-intercept 4, y-intercept -2

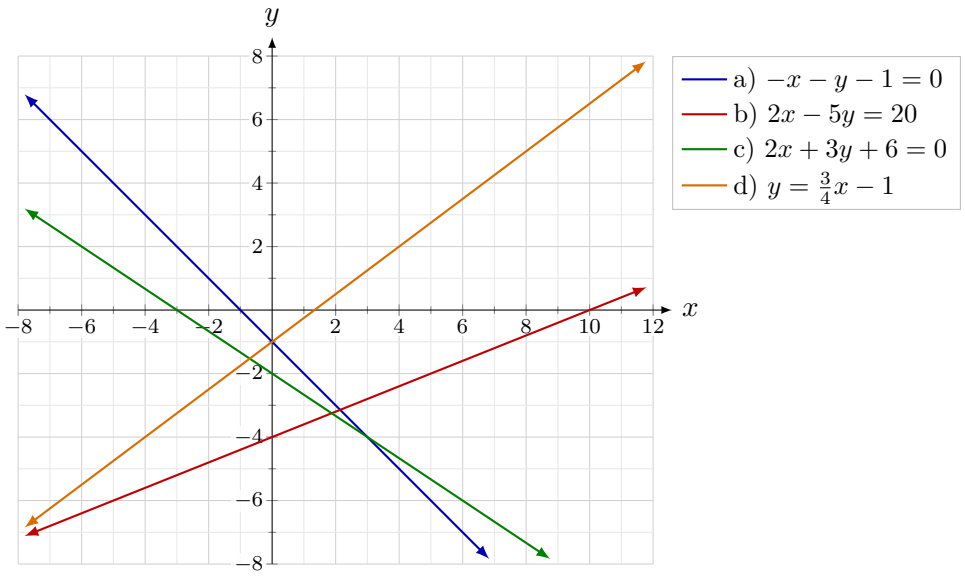


8. a) $y = -x - 1$

b) x-intercept 10, y-intercept -4

c) x-intercept -3, y-intercept -2

d) slope $\frac{3}{4}$, y-intercept -1



Percent

9. a) 4.2 L b) 0.72 kg c) 44 g

10. a) \$80 b) \$34.80 c) \$46.50 d) \$562.50