

P-13 Find the intersection point of each of the following pairs of lines. Be sure to follow the method used in the example problem.

1. $y = 2x + 3$ and $y = x + 7$

$$\begin{aligned} 2x + 3 &= x + 7 \\ x + 3 &= 7 && (4, 11) \\ x &= 4 \\ y &= 2 \cdot 4 + 3 = 8 + 3 = 11 \end{aligned}$$

5. $y = x - 17$ and $y = -2x - 2$

$$\begin{aligned} x - 17 &= -2x - 2 \\ 3x &= 15 && (5, -12) \\ x &= 5 \\ y &= 5 - 17 = -12 \end{aligned}$$

2. $y = 3x + 9$ and $y = -x + 1$

$$\begin{aligned} 3x + 9 &= -x + 1 \\ 4x + 9 &= 1 && (-2, 3) \\ 4x &= -8 \\ x &= -2 \\ y &= 3 \cdot (-2) + 9 = -6 + 9 = 3 \end{aligned}$$

6. $y = 3x + 8$ and $y = 2x + 8$

$$\begin{aligned} 3x + 8 &= 2x + 8 \\ x &= 0 && (0, 8) \\ y &= 8 \end{aligned}$$

3. $y = -2x - 7$ and $y = x - 1$

$$\begin{aligned} -2x - 7 &= x - 1 \\ -7 &= 3x - 1 && (-2, -3) \\ -6 &= 3x \\ -2 &= x \\ y &= -2 - 1 = -3 \end{aligned}$$

7. $y = 2x + 3$ and $y = -x$

$$\begin{aligned} 2x + 3 &= -x \\ 3x + 3 &= 0 && (-1, 1) \\ 3x &= -3 \\ x &= -1 \\ y &= 2 \cdot (-1) + 3 = 1 \end{aligned}$$

4. $y = 5x + 7$ and $y = -2x - 7$

$$\begin{aligned} 5x + 7 &= -2x - 7 \\ 7x &= -14 && (-2, -3) \\ x &= -2 \\ y &= 5 \cdot (-2) + 7 = -10 + 7 = -3 \end{aligned}$$

8. $y = 3x + 5$ and $y = 3x - 5$

parallel lines don't
intersect!

The freezing rains of late autumn chill poor Lil as she sells matches on a street corner of the city. She must earn a few dollars by nightfall lest she and her sick old mother be thrown out of their one room hovel by Percy, the cruel slumlord. But business is not good. She only gets five cents for each box of matches she sells and they cost her three cents apiece. Worse still, she has to pay two dollars protection each day to keep from being arrested for peddling without a license.

9. Express as algebraic equations the relationships between Lil's costs and revenues and the number of boxes of matches she sells each day.

let x be # of boxes
 R be revenues
 C be costs

$$\begin{aligned} C &= 3x + 200 \text{ (in pennies!)} \\ R &= 5x \end{aligned}$$

10. Use your equations to find how many boxes of matches poor Lil must sell each day just to break even.

revenue = cost so

$$\begin{aligned} R &= C \\ 5x &= 3x + 200 \\ 2x &= 200 \\ x &= 100 \end{aligned}$$

She must sell 100 boxes just to break even. (!)