

Al Muizzuddin F
Matematika Ekonomi

PERSAMAAN LINEAR

Contoh Soal

- ⦿ Gambarkan kurva permintaan untuk persamaan berikut:
 - $P = -2Q + 50$
- ⦿ Kemudian tentukan nilai dari:
 - P ketika $Q = 9$
 - Q ketika $P = 10$

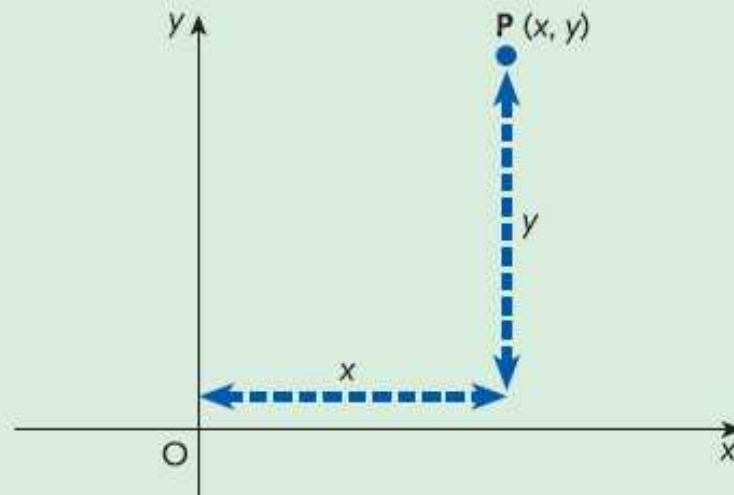
Menggambar Persamaan Linear

◎ Tujuan kita adalah ...

- Plot points on graph paper given their coordinates.
- Add, subtract, multiply and divide negative numbers.
- Sketch a line by finding the coordinates of two points on the line.
- Solve simultaneous linear equations graphically.
- Sketch a line by using its slope and intercept.

Gambar Awal

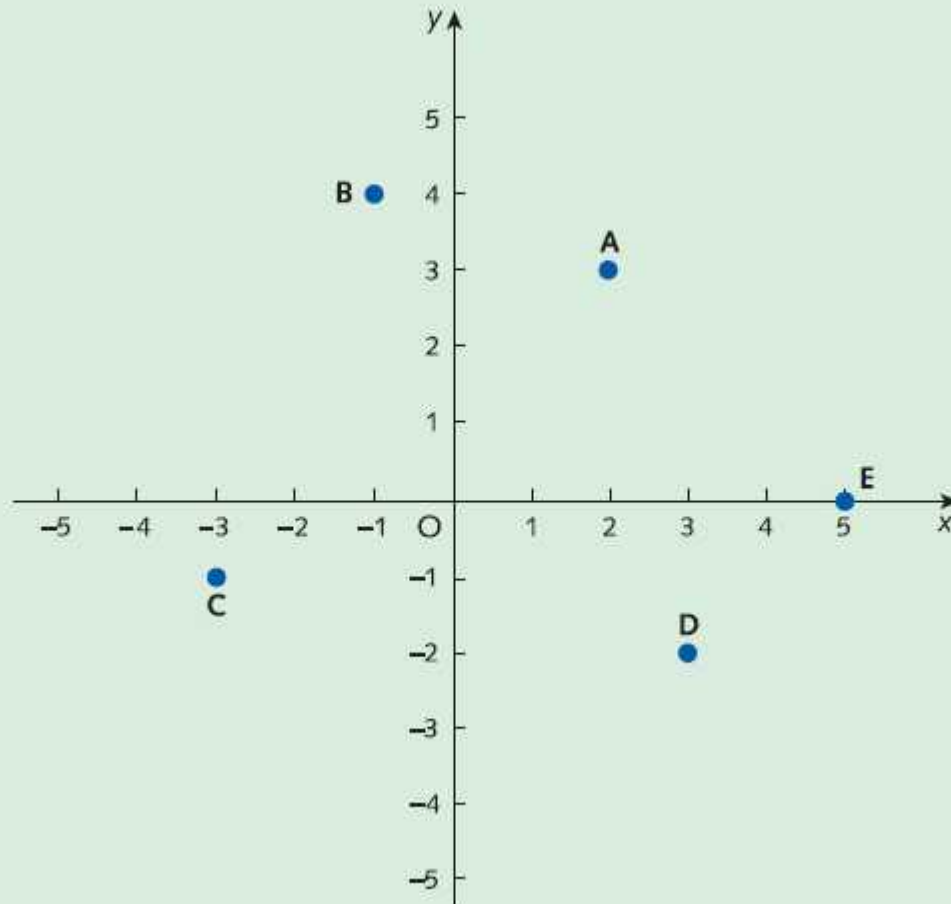
Figure 1.1



Plot point..

Plot the points $A(2, 3)$, $B(-1, 4)$, $C(-3, -1)$, $D(3, -2)$ and $E(5, 0)$.

Figure 1.2



Aturan perkalian

Before we can continue the discussion of graphs it is worthwhile revising the properties of negative numbers. The rules for the multiplication of negative numbers are

$$\boxed{\text{negative}} \times \boxed{\text{negative}} = \boxed{\text{positive}}$$

$$\boxed{\text{negative}} \times \boxed{\text{positive}} = \boxed{\text{negative}}$$

It does not matter in which order two numbers are multiplied, so

$$\boxed{\text{positive}} \times \boxed{\text{negative}} = \boxed{\text{negative}}$$

Example

Evaluate

(a) $(-2) \times (-4) \times (-1) \times 2 \times (-1) \times (-3)$

(b) $\frac{5 \times (-4) \times (-1) \times (-3)}{(-6) \times 2}$

Solution

(a) To evaluate

$$(-2) \times (-4) \times (-1) \times (2) \times (-1) \times (-3)$$

we ignore the signs to get a preliminary value, 48. However, because there are an odd number of minus signs altogether (in fact, five) the final answer is -48 .

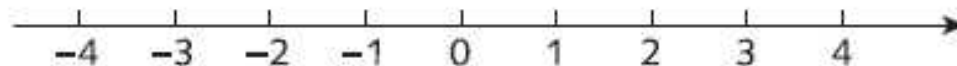
(b) Ignoring the signs gives

$$\frac{5 \times 4 \times 1 \times 3}{6 \times 2} = \frac{60}{12} = 5$$

There are an even number of minus signs (in fact, four) so the answer is 5.

Aturan penjumlahan dan pengurangan dalam grafik

To add or subtract negative numbers it helps to think in terms of a picture of the x axis:



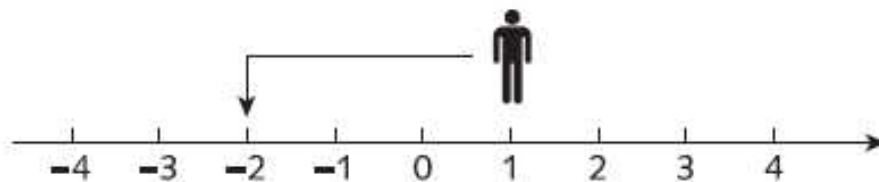
If b is a positive number then

$$a - b$$

can be thought of as an instruction to start at a and to move b units to the left. For example,

$$1 - 3 = -2$$

because if you start at 1 and move 3 units to the left, you end up at -2 :



On the other hand,

$$a - (-b)$$

is taken to be $a + b$. This follows from the rule for multiplying two negative numbers, since

$$-(-b) = (-1) \times (-b) = b$$

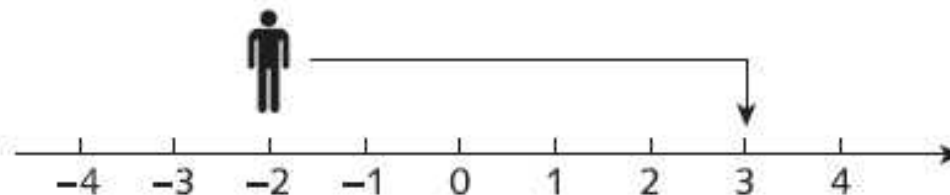
Consequently, to evaluate

$$a - (-b)$$

you start at a and move b units to the right (that is, in the positive direction). For example,

$$-2 - (-5) = -2 + 5 = 3$$

because if you start at -2 and move 5 units to the right you end up at 3.



In Practice Problem 1 you will have noticed that the five points $(2, 5)$, $(1, 3)$, $(0, 1)$, $(-2, -3)$ and $(-3, -5)$ all lie on a straight line. In fact, the equation of this line is

$$-2x + y = 1$$

Any point lies on this line if its x and y coordinates satisfy this equation. For example, $(2, 5)$ lies on the line because when the values $x = 2$ and $y = 5$ are substituted into the left-hand side of the equation we obtain

$$-2(2) + 5 = -4 + 5 = 1$$

Table 1.1

Point	Check	
$(1, 3)$	$-2(1) + 3 = -2 + 3 = 1$	✓
$(0, 1)$	$-2(0) + 1 = 0 + 1 = 1$	✓
$(-2, -3)$	$-2(-2) - 3 = 4 - 3 = 1$	✓
$(-3, -5)$	$-2(-3) - 5 = 6 - 5 = 1$	✓

Apa itu persamaan linear?

Notice how the rules for manipulating negative numbers have been used in the calculations.

The general equation of a straight line takes the form

$$\boxed{\text{a multiple of } x} + \boxed{\text{a multiple of } y} = \boxed{\text{a number}}$$

that is,

$$dx + ey = f$$

for some given numbers d , e and f . Consequently, such an equation is called a *linear equation*.

The numbers d and e are referred to as the *coefficients*. The coefficients of the linear equation,

$$-2x + y = 1$$

are -2 and 1 (the coefficient of y is 1 because y can be thought of as $1 \times y$).

Example

Decide which of the following points lie on the line $5x - 2y = 6$:

A(0, -3), B(2, 2), C(-10, -28) and D(4, 8)

Solution

$$5(0) - 2(-3) = 0 - (-6) = 0 + 6 = 6$$

$$5(2) - 2(2) = 10 - 4 = 6$$

$$5(-10) - 2(-28) = -50 - (-56) = -50 + 56 = 6$$

$$5(4) - 2(8) = 20 - 16 = 4 \neq 6$$

Hence points A, B and C lie on the line, but D does not lie on the line.

Example

Sketch the line

$$4x + 3y = 11$$

Solution

For the first point, let us choose $x = 5$. Substitution of this number into the equation gives

$$4(5) + 3y = 11$$

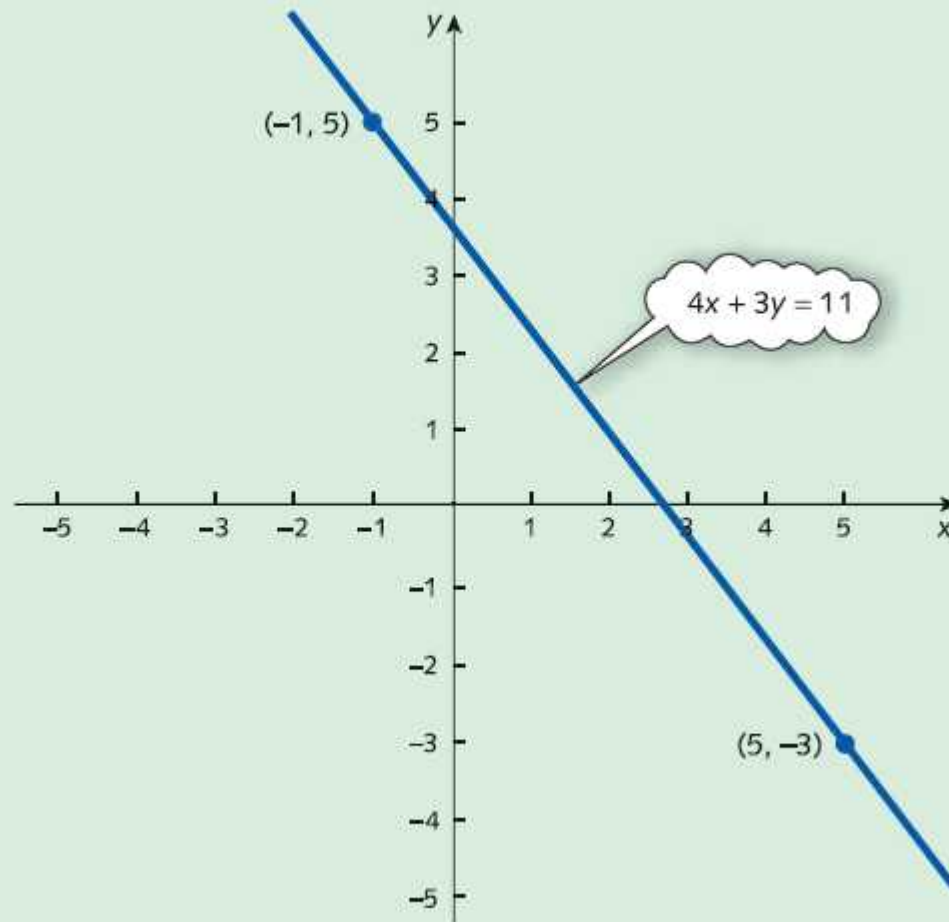
$$20 + 3y = 11$$

For the second point, let us choose $x = -1$. Substitution of this number into the equation gives

$$4(-1) + 3y = 11$$

$$-4 + 3y = 11$$

Figure 1.3



Contoh

Sketch the line

$$2x + y = 5$$

Solution

Setting $x = 0$ gives

$$2(0) + y = 5$$

$$0 + y = 5$$

$$y = 5$$

Hence $(0, 5)$ lies on the line.

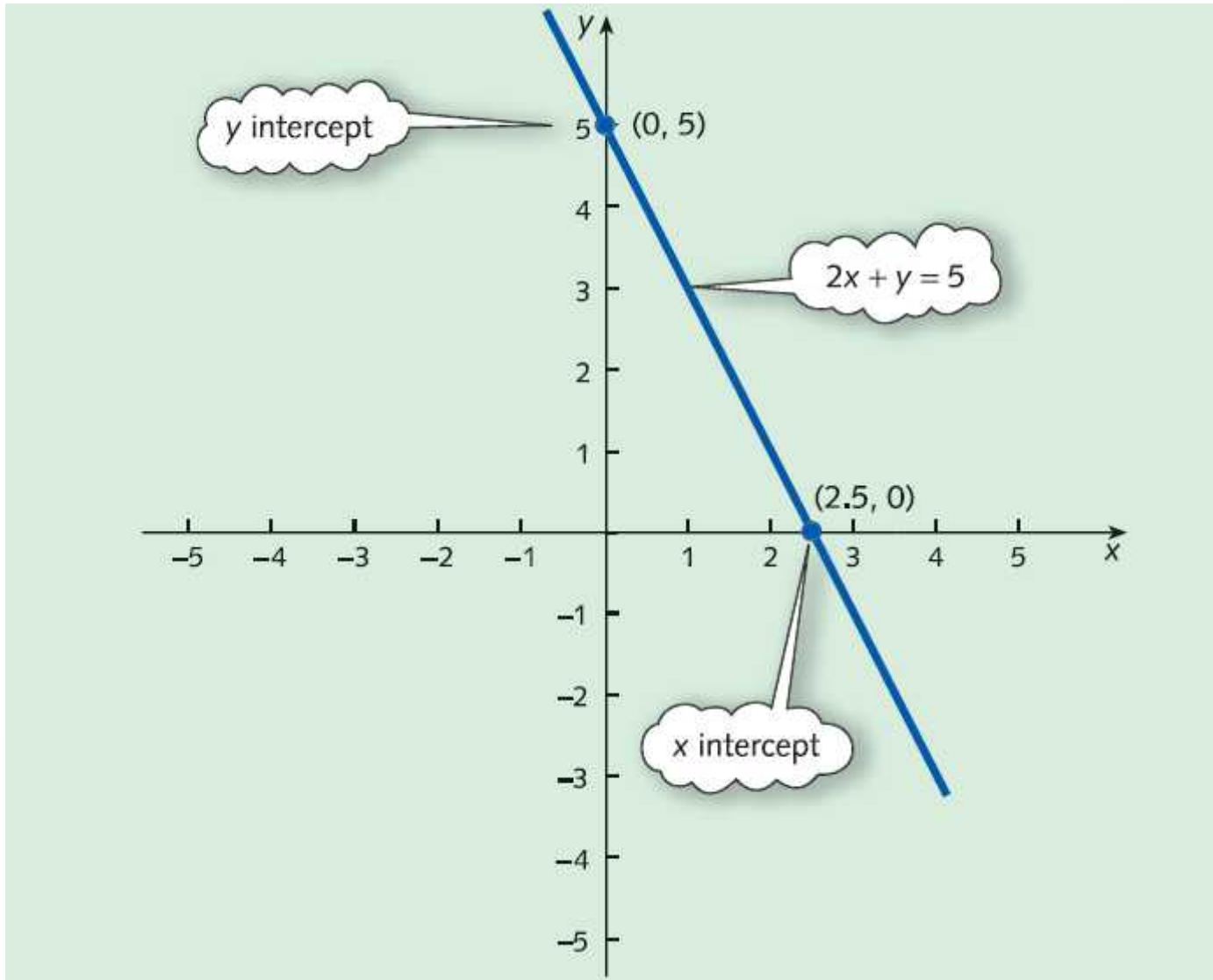
Setting $y = 0$ gives

$$2x + 0 = 5$$

$$2x = 5$$

$$x = 5/2 \quad (\text{divide both sides by } 2)$$

Hence $(5/2, 0)$ lies on the line.



Contoh

Find the point of intersection of the two lines

$$4x + 3y = 11$$

$$2x + y = 5$$

Solution

We have already seen how to sketch these lines in the previous two examples. We discovered that

$$4x + 3y = 11$$

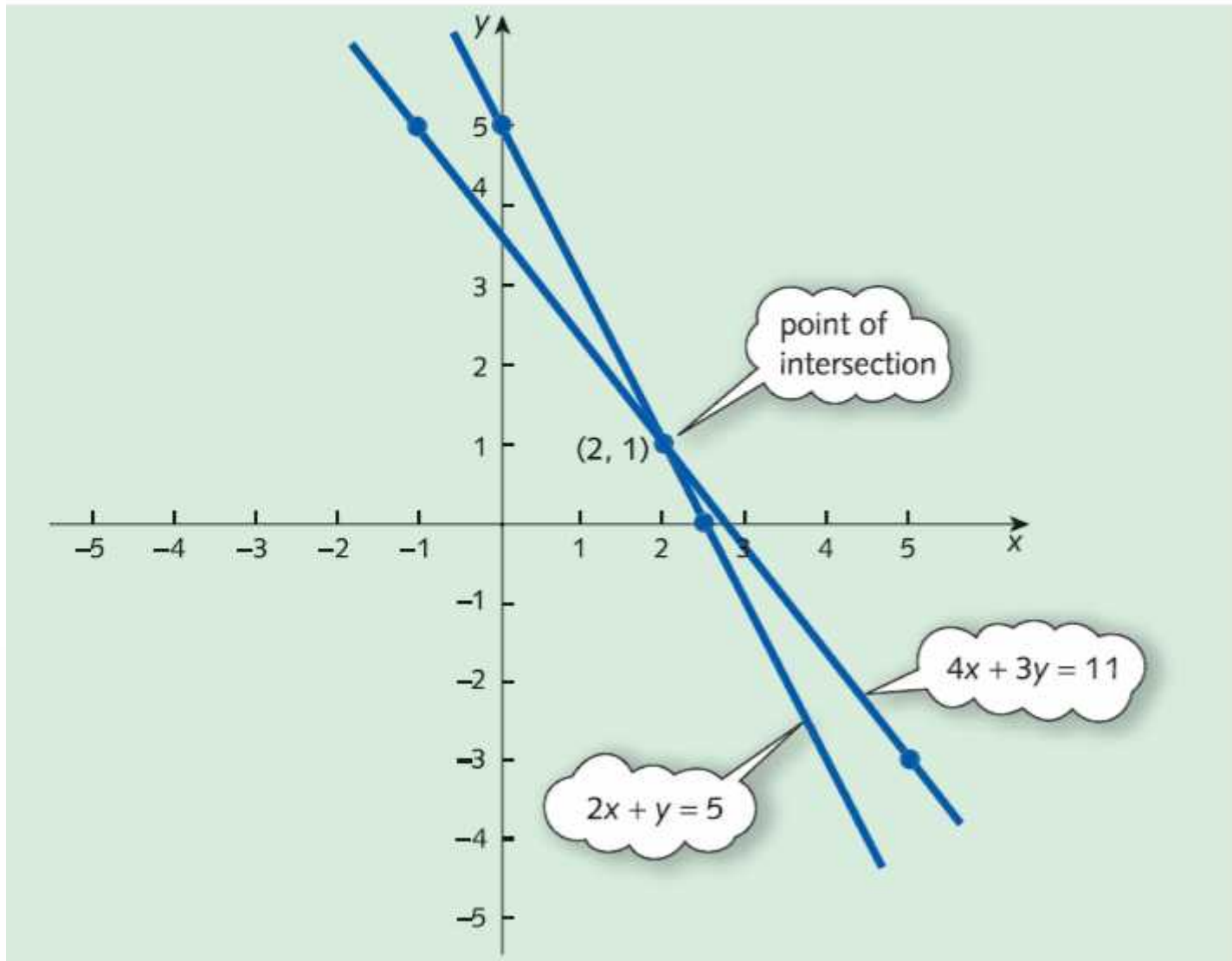
passes through $(5, -3)$ and $(-1, 5)$, and that

$$2x + y = 5$$

passes through $(0, 5)$ and $(5/2, 0)$.

$4x + 3y = 11$ because $4(2) + 3(1) = 8 + 3 = 11$ ✓

and lies on $2x + y = 5$ because $2(2) + 1 = 4 + 1 = 5$ ✓



For this reason, we say that $x = 2, y = 1$, is the solution of the *simultaneous linear equations*

$$4x + 3y = 11$$

$$2x + y = 5$$

Latihan Soal

10 Without using a calculator evaluate

(a) $10 \times (-2)$

(b) $(-1) \times (-3)$

(c) $(-8) \div 2$

(d) $(-5) \div (-5)$

(e) $5 - 6$

(f) $-1 - 2$

(g) $7 - (-4)$

(h) $-9 - (-9)$

(i) $\frac{(-3) \times (-6) \times (-1)}{2 - 3}$

11 If $x = 2$ and $y = -3$ evaluate

(a) $2x + y$

(b) $x - y$

(c) $3x + 4y$

(d) xy

(e) $5xy$

(f) $4x - 6xy$

12 Solve the following equations:

(a) $2x = 1$

(b) $2x + 5 = 13$

(c) $3 - x = 7$

(d) $3 - 4x = 5$

(e) $7x = 0$

(f) $\frac{3}{x} + 7 = 10$

Lanjut

14 Solve the following pairs of simultaneous linear equations graphically:

(a) $-2x + y = 2$

$$2x + y = -6$$

(b) $3x + 4y = 12$

$$x + 4y = 8$$

(c) $2x + y = 4$

$$4x - 3y = 3$$

(d) $x + y = 1$

$$6x + 5y = 15$$

◎ Selesai...