Substitution Method

Steps:

get x or y by itself

i) Choose one equation and isolate one variable;
   this equation will be considered the first equation.
   (easiest one to get x= or y= from either eqn 1 or eqn 2)

ii) Substitute the solution from step 1 into the second
    equation and solve for the variable in the equation.

iii) Using the value found in step 2, substitute it into the
     first equation and solve for the second variable.

iv) Substitute the values for both variables into both
    equations to show they are correct.

Solve this system of equation by substitution.

$y = 15+6x$
$-3x -2y=0$

$-3x -2y = 0$
$-3x -2(15+6x) = 0$
$-3x -30 -12x = 0$
$-3x \quad -12x = 0 +30$
$\quad -15x = 30$
$\quad \underline{-15} \quad \underline{-15}$
$\quad x = -2$

$y = 15+6x$
$y = 15 + 6(-2)$
$y = 15 - 12$
$y = 3$

$(-2,3)$

Solve the system by Substitution Method

solve for x ...... → $\quad$ x = 3 - 2y

$$x + 2y = 3$$
$$3x + 5y = 8$$

$$\underline{3x} \quad + 5y = 8$$
$$3(3{-}2y) + 5y = 8$$
$$9 - 6y + 5y = 8$$
$$- 6y + 5y = 8 \text{ -}9$$
$$-y = -1$$
$$y = 1$$

$$x + \underline{2y} \quad = 3$$
$$x + 2(1) = 3$$
$$x + 2 \quad = 3$$
$$x \quad\quad = 3{-}2$$
$$x \quad\quad = 1$$

$$(1,1)$$

Use Substitution to Find the Point of Intersection

1) $x - 4y = 6$ $\longrightarrow$ $x = 6 + 4y$
   $7x + 6y = 8$

$7x + 6y = 8$

$7(6+4y) + 6y = 8$

$42 + 28y + 6y = 8$

$28y + 6y = 8 - 42$

$\dfrac{34y}{34} = \dfrac{-34}{34}$

$\boxed{y = -1}$

$x = 6 + 4y$

$x = 6 + 4(-1)$

$x = 6 - 4$

$\boxed{x = 2}$

$\boxed{(2, -1)}$

Use Substitution to Find the Point of Intersection

2) $2x + y = 9$ $\longrightarrow$ $y = 9 - 2x$

$3x - 5y = -19$

$3x - 5y = -19$

$3x - 5(9 - 2x) = -19$

$3x - 45 + 10x = -19$

$3x + 10x = -19 + 45$

$\dfrac{13x}{13} = \dfrac{26}{13}$

$\boxed{x = 2}$

$y = 9 - 2x$

$y = 9 - 2(2)$

$y = 9 - 4$

$\boxed{y = 5}$

$\boxed{(2, 5)}$

Answers to worksheet:

① $(1,-1)$　　　② $(3,2)$

③ $(0,-1)$　　　④ $(6,6)$

⑤ $(3,-7)$　　　⑥ $(-6,1)$

⑦ $(6,-4)$　　　⑧ $(-6,2)$

⑨ $(-2,6)$　　　⑩ $(3,1)$

Questions from homework

① $7x + y = 6$ $\xrightarrow{\text{solve for } y}$ (i) $\underline{y = -7x + 6}$

$5x - 5y = 10$

(ii) $5x - 5y = 10$

$5x - 5(-7x + 6) = 10$

$\underline{5x} + \underline{35x} - 30 = 10$

$40x = 10 + 30$

$\dfrac{40x}{40} = \dfrac{40}{40}$

$\boxed{x = 1}$

(iii) $7x + y = 6$

$7(1) + y = 6$

$7 + y = 6$

$y = 6 - 7$

$\boxed{y = -1}$

(iv) $(1, -1)$

Questions from homework

(5) $y = -4x + 5$ → (I) $y = \underline{-4x + 5}$

$y = 5x - 22$ (II) $y = 5x - 22$

$-4x + 5 = 5x - 22$

$-4x - 5x = -22 - 5$

$\dfrac{-9x}{-9} = \dfrac{-27}{-9}$

$\boxed{x = 3}$

(III) $y = -4x + 5$

$y = -4(3) + 5$

$y = -12 + 5$

$\boxed{y = -7}$

(IV) $(3, -7)$

Questions from homework

7) $y = -4$ →   (i) $\underline{y = -4}$

$-2x + 2y = -20$ (ii) $-2x + 2\underline{y} = -20$

$$-2x + 2(-4) = -20$$

$$-2x - 8 = -20$$

$$-2x = -20 + 8$$

$$\frac{-2x}{-2} = \frac{-12}{-2}$$

$$\boxed{x = 6}$$

(iii) $\boxed{y = -4}$

(iv) $(6, -4)$

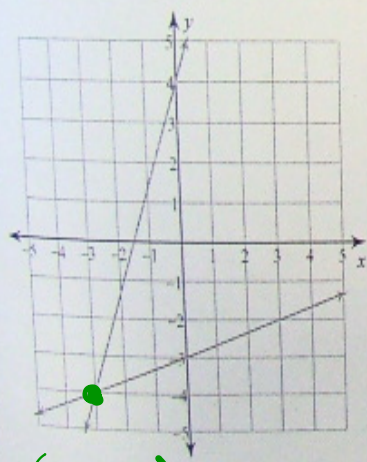1) $y = -\dfrac{2}{3}x + 4$

   $y = x - 1$

   (3,2)

2) $y = -3x - 4$

   $y = 2x + 1$

   (-1,-1)
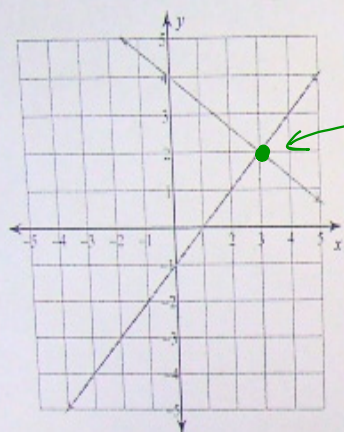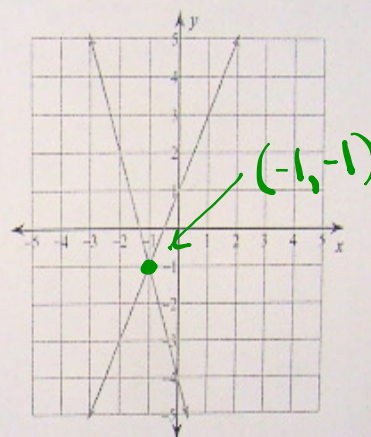
3) $y = \dfrac{1}{3}x - 3$

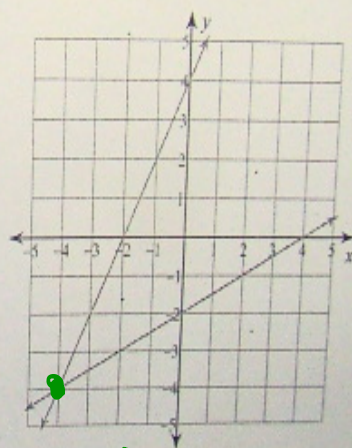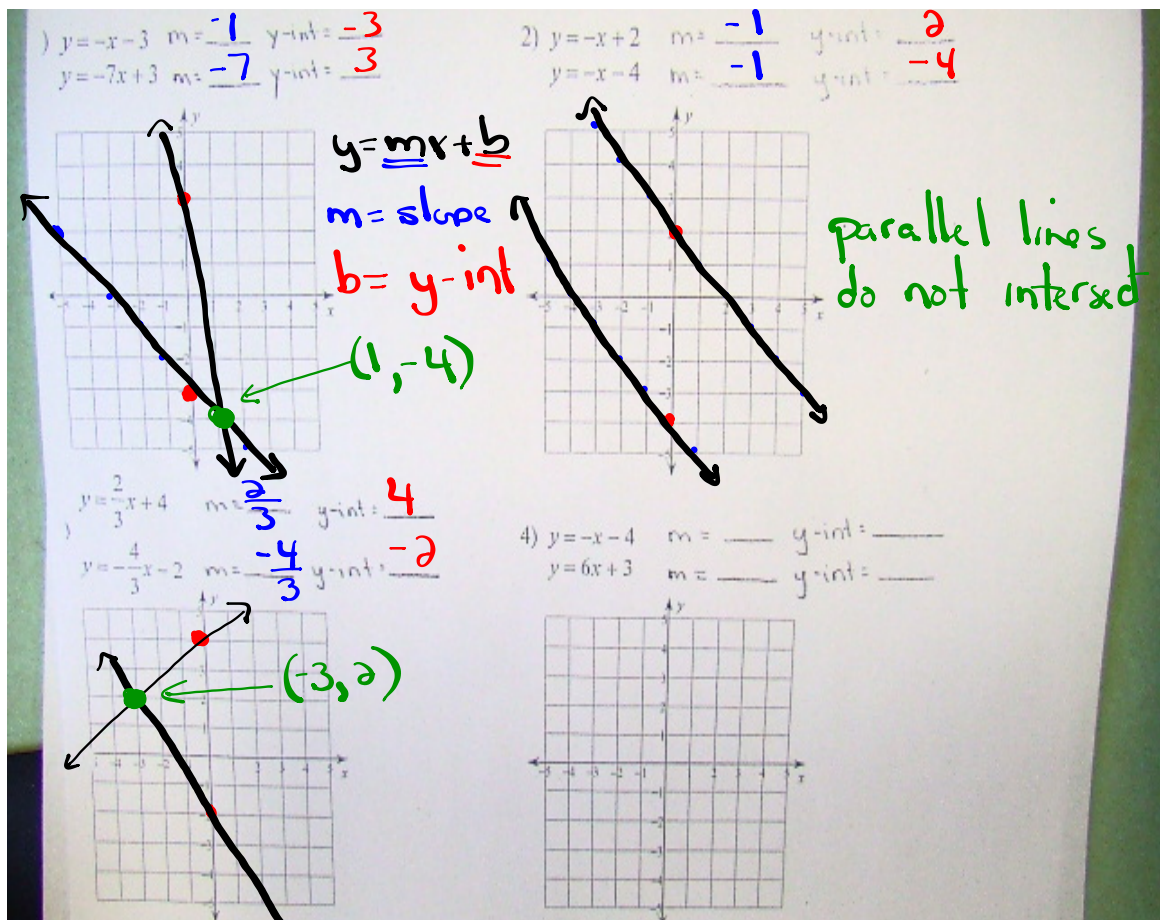4) $y = 2x + 4$

3) $y = \dfrac{1}{3}x - 3$

$y = \dfrac{8}{3}x + 4$

(-3,-4)

4) $y = 2x + 4$

$y = \dfrac{1}{2}x - 2$

(-4,-4)

) $y = -x - 3$ $m = \underline{-1}$ $y\text{-int} = \underline{-3}$
$y = -7x + 3$ $m = \underline{-7}$ $y\text{-int} = \underline{3}$

2) $y = -x + 2$ $m = \underline{-1}$ $y\text{-int} = \underline{2}$
$y = -x - 4$ $m = \underline{-1}$ $y\text{-int} = \underline{-4}$

$y = mx + b$

$m = $ slope

$b = y\text{-int}$

parallel lines
do not intersect

$(1, -4)$

$y = \frac{2}{3}x + 4$ $m = \underline{\frac{2}{3}}$ $y\text{-int} = \underline{4}$
$y = -\frac{4}{3}x - 2$ $m = \underline{\frac{-4}{3}}$ $y\text{-int} = \underline{-2}$

4) $y = -x - 4$ $m = \underline{\quad}$ $y\text{-int} = \underline{\quad}$
$y = 6x + 3$ $m = \underline{\quad}$ $y\text{-int} = \underline{\quad}$

$(-3, 2)$

$$y = \underline{m}x + \underline{\underline{b}}$$

➢ Joe charges a <u>sitting fee</u> of <u>$15.00</u> plus an additional <u>$10.00 an hour</u> to tutor. $m = 10$ $b = 15$

$$y = 10x + 15$$

➢ Bob charges a <u>sitting fee</u> of <u>$30.00</u> plus an additional <u>$5.00 an hour</u> to tutor. $m = 5$ $b = 30$

$$y = 5x + 30$$

Where do these lines intersect?

$$y = 10x + 15 \longrightarrow \text{(i) } y = \underline{10x + 15}$$
$$y = 5x + 30 \qquad \text{(ii) } y = 5x + 30$$

(iii) $y = 10x + 15$

$$10x + 15 = 5x + 30$$
$$10x - 5x = 30 - 15$$
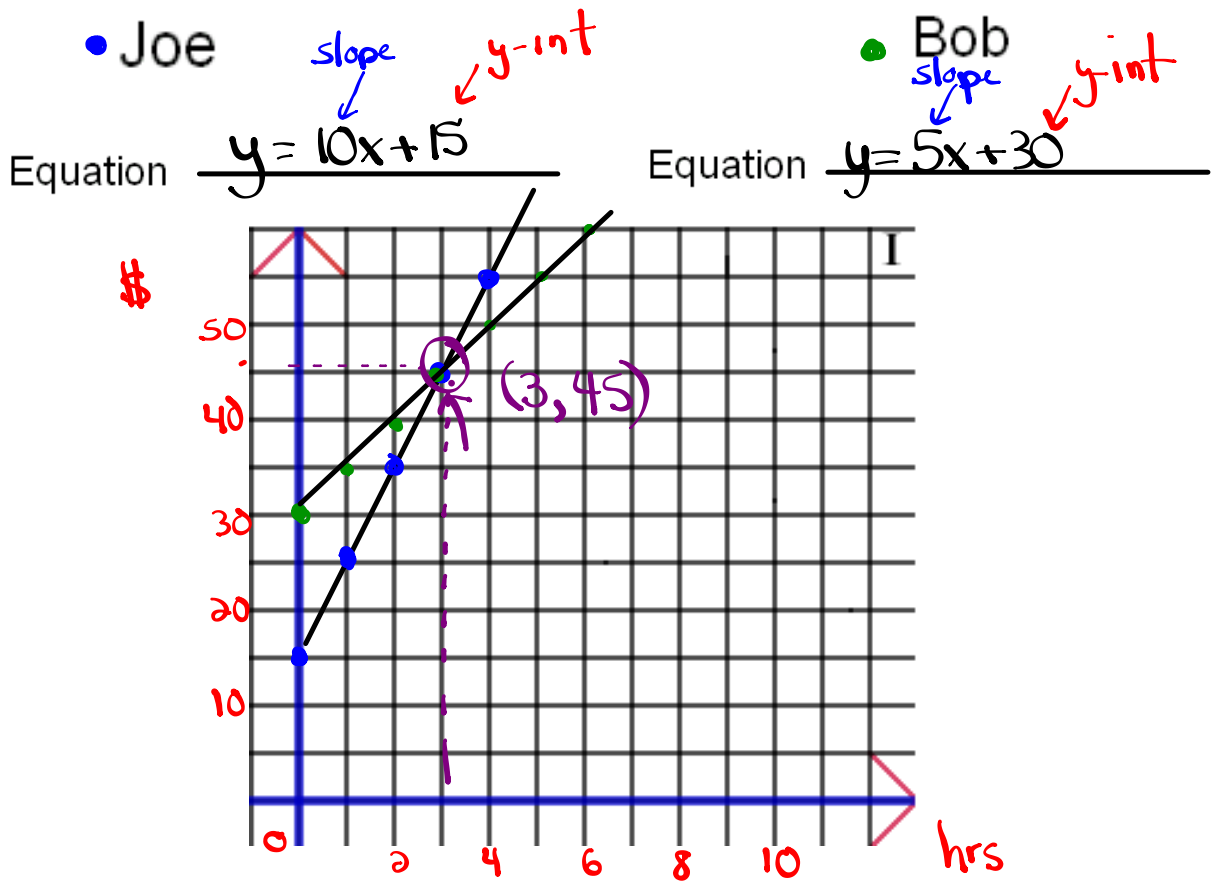$$5x = 15$$
$$\frac{5x}{5} = \frac{15}{5}$$
$$\boxed{x = 3}$$

$$y = 10(3) + 15$$
$$y = 30 + 15$$
$$\boxed{y = 45}$$

(iv) $(3, 45)$

• Joe   slope   ← y-int

Equation $y = 10x + 15$

• Bob   slope   y-int

Equation $y = 5x + 30$

(3, 45)

If you were planning to get tutored for 5 hours, who would you ask?

Bob is cheaper

Answers to Homework

① C   ② D

③ C   ④ A

⑤ (3,5)   ⑥ (-5,0)

⑦ (1,-2)   ⑧ No Solution (Parallel lines)

⑨ (2,-5)   ⑩ (3,4)