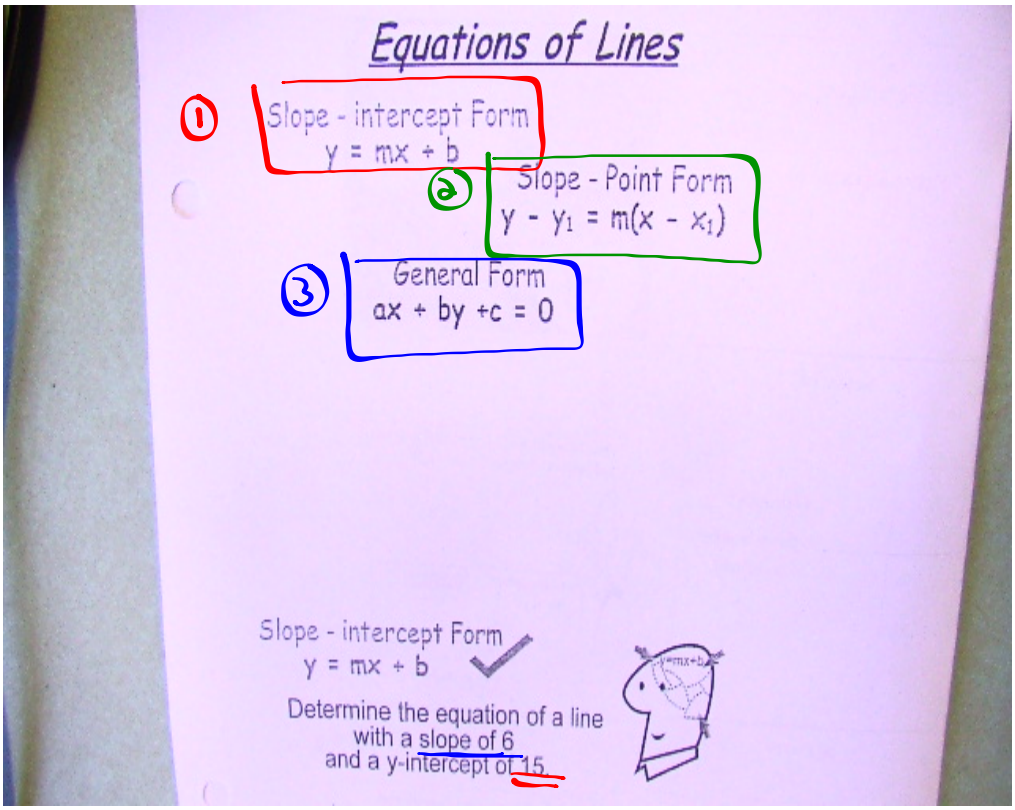
Equations of Lines

Kicking it up a notch!!



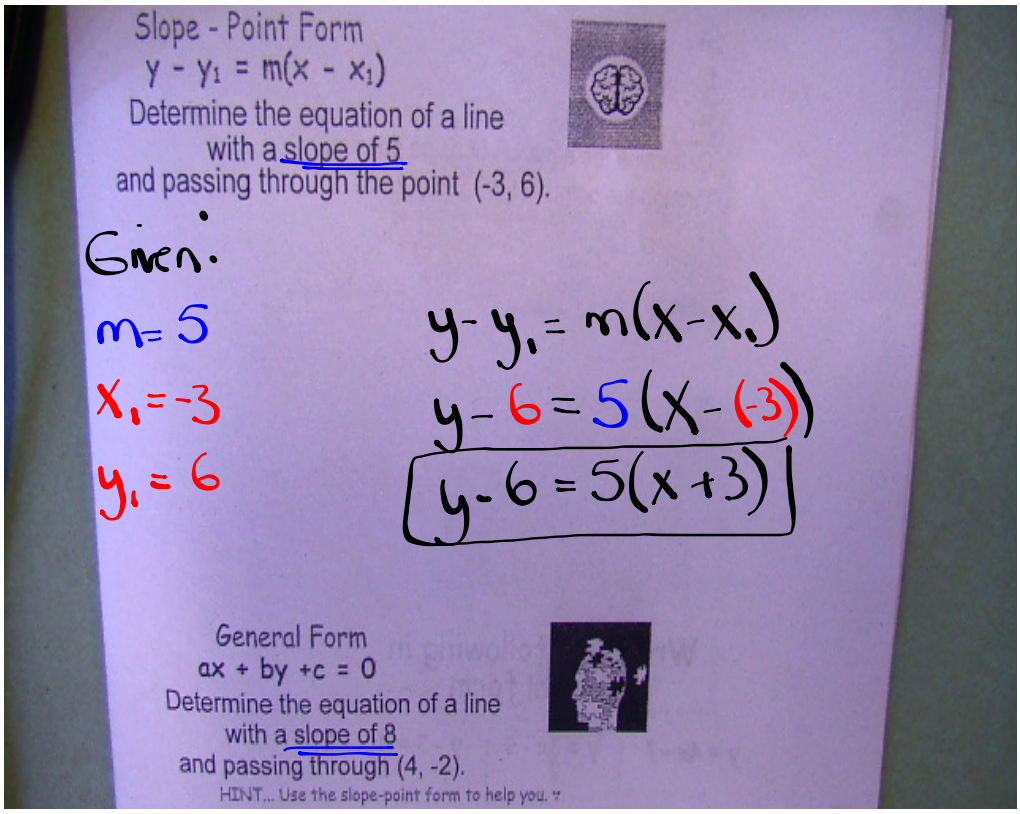
Given:

$m = 6$

$b = y\text{-int} = 15$

$y = mx + b$

$y = 6x + 15$



Given:

$m = 5$

$x_1 = -3$

$y_1 = 6$

$y - y_1 = m(x - x_1)$

$y - 6 = 5(x - (-3))$

$y - 6 = 5(x + 3)$

Given:

$m = 8$

$x_1 = 4$

$y_1 = -2$

$y - y_1 = m(x - x_1)$

$y - (-2) = 8(x - 4)$

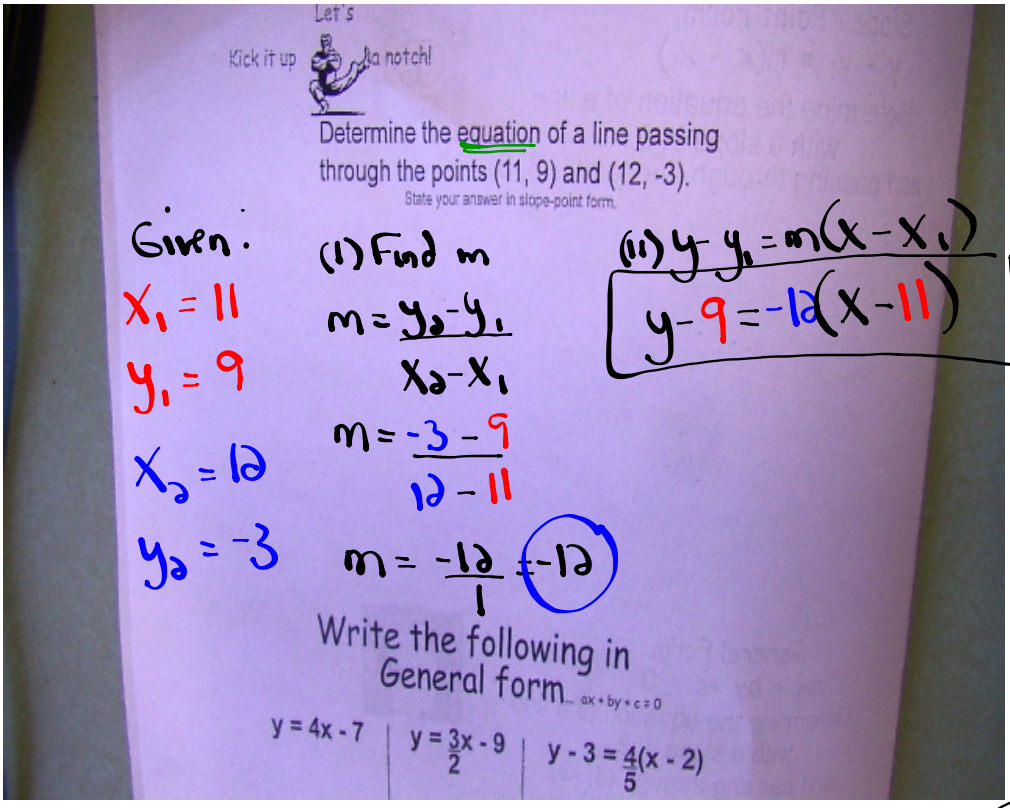
$y + 2 = 8(x - 4)$ Slope-Point Form

$y + 2 = 8x - 32$

$-8x + y + 2 + 32 = 0$

$-8x + y + 34 = 0$

$8x - y - 34 = 0$ General Form


Let's
Kick it up a notch!

Determine the equation of a line passing through the points (11, 9) and (12, -3).

State your answer in slope-point form.

Given:

$x_1 = 11$

$y_1 = 9$

$x_2 = 12$

$y_2 = -3$

(i) Find m

$m = \frac{y_2 - y_1}{x_2 - x_1}$

$m = \frac{-3 - 9}{12 - 11}$

$m = \frac{-12}{1} = -12$

(ii) $y - y_1 = m(x - x_1)$

$y - 9 = -12(x - 11)$

Write the following in General form $ax + by + c = 0$

$y = 4x - 7$ | $y = \frac{3}{2}x - 9$ | $y - 3 = \frac{4}{5}(x - 2)$

(i) $y = 4x - 7$

$0 = 4x - y - 7$

$4x - y - 7 = 0$

(ii) $y = \frac{3}{2}x - 9$

$2y = \frac{6x}{2} - 18$

$2y = 3x - 18$

$0 = 3x - 2y - 18$

$3x - 2y - 18 = 0$

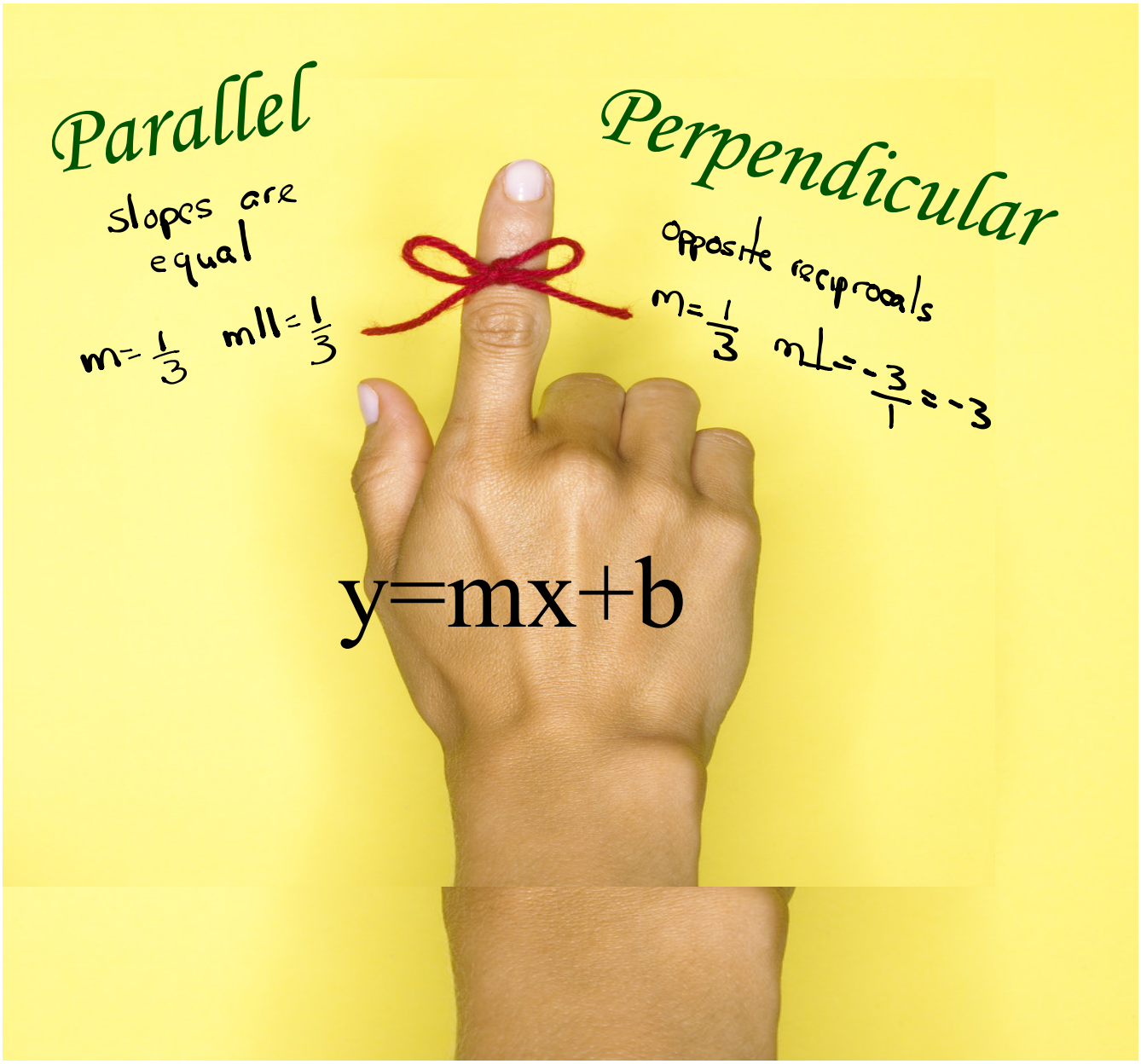
(iii) $y - 3 = \frac{4}{5}(x - 2)$

$5y - 15 = 4x - 8$

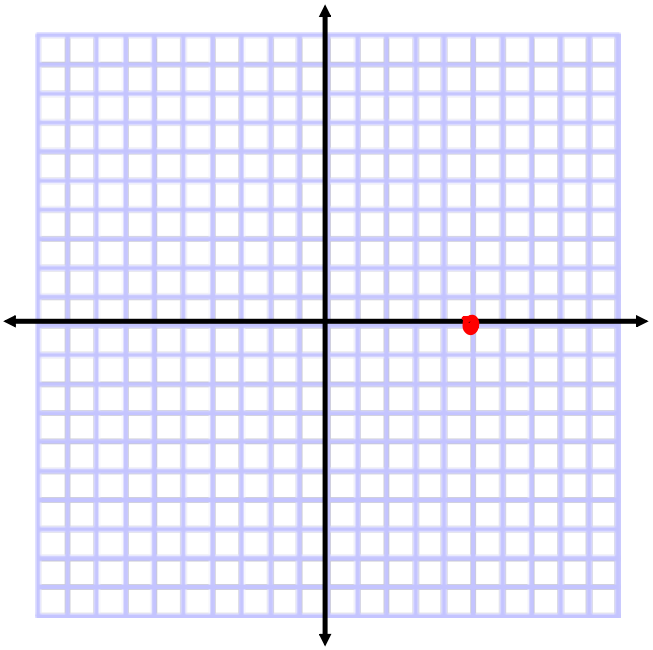
$0 = 4x - 5y - 8 + 15$

$0 = 4x - 5y + 7$

$4x - 5y + 7 = 0$


Parallel
slopes are equal
$m = \frac{1}{3}$ $m \parallel = \frac{1}{3}$
Perpendicular
opposite reciprocals
$m = \frac{1}{3}$ $m \perp = -\frac{3}{1} = -3$
y=mx+b

Reminder !!!
Whenever you see the words Parallel & Perpendicular think
Slope



x-intercept = 5

$(y=0)$

Do you know the co-ordinate?

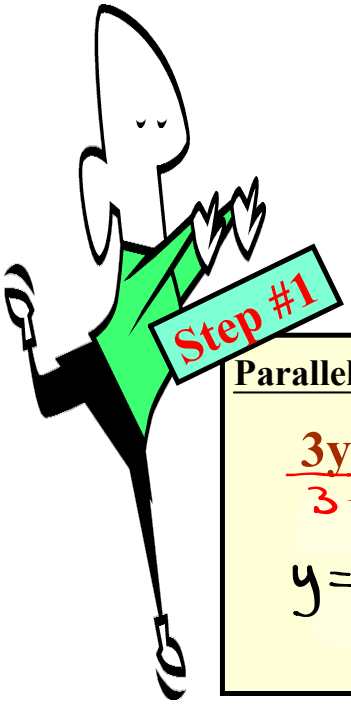
$(5,0)$

y-intercept
x=0
Reminder!
x-intercept
y=0

Find the equation of a line parallel to 3y=4x-1 and passing through the point (4,2).

$x_1 = 4$ $m = \frac{4}{3}$

$y_1 = 2$



Step #1

Parallel - (Same Slope)

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

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

$m = \frac{4}{3}$

$m_{\parallel} = \frac{4}{3}$

Step #2

Write Equation in General Form

$y - y_1 = m(x - x_1)$

$y - 2 = \frac{4}{3}(x - 4)$

$3 \cdot y - 2 \cdot 3 = \frac{4x}{3} \cdot 3 - \frac{16}{3} \cdot 3$

$3y - 6 = 4x - 16$

$0 = 4x - 3y - 16 + 6$

$\boxed{0 = 4x - 3y - 10}$

Determine the equation of a line perpendicular to $4x+5y=7$ and having an x-intercept of -2.

$x_1 = -2$

$y_1 = 0$

Step #1

Opposite Reciprocal Slope

$4x+5y=7$

$\frac{5y}{5} = \frac{-4x}{5} + \frac{7}{5}$

$y = \frac{-4}{5}x + \frac{7}{5}$

$m = \frac{-4}{5}$

$m\perp = \frac{5}{4}$

Step #2

Point x-int (y = 0)

Point (-2, 0)

$x_1 = -2$

$y_1 = 0$

Step #3

Write Equation in General Form

$y - y_1 = m(x - x_1)$

$y - 0 = \frac{5}{4}(x - (-2))$

$y = \frac{5}{4}(x+2)$

4. $y = \frac{5x}{4} + \frac{10}{4}$

$4y = 5x + 10$

$0 = 5x - 4y + 10$

Determine the equation of a horizontal line with a y-intercept of -3

Step #1

Horizontal Line

Slope = 0/1 or 0

$m = 0$

Step #2

Point y-int = -3

(0, -3)

$x_1 = 0$

$y_1 = -3$

Step #3

Write Equation in General Form

$y = mx + b$

$y = 0x + -3$

$y = 0 - 3$

$y = -3$

Check out the sheet.

M(3, 5) U(-2, -1) D(0, -4)
Find the equation of a line parallel to MD and passing through U.

$y = mx + b$ (Slope intercept form)

$ax + by + c = 0$ (General form)

Ex: $4x + 5y - 10 = 0$ (General form)

$\frac{5y}{5} = \frac{-4x}{5} + \frac{10}{5}$

$y = -\frac{4}{5}x + 2$ (Slope Intercept Form)

Ex. $y = \frac{2}{3}x - 7$ (Slope Intercept form)

$0 = {}^{3\cdot}\frac{2}{3}x - \frac{3\cdot y}{1} - \frac{3\cdot 7}{1}$ Common denominator = 3

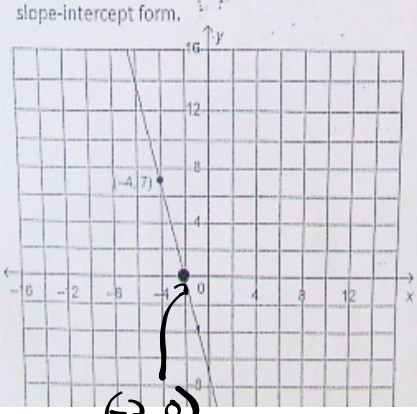
$0 = 2x - 3y - 21$ (General form)

Questions from Homework

Equations of lines .... Kicking it up a notch!! ☺

1. Determine the equation of a line...
   a) Parallel to 5y=10-3x and passing through (-2,7). (State your answer in slope- point form.)
   b) Perpendicular to 6x = 3y + 9 and having an x-intercept of 7. (State your answer in general form.)
   c) Passing through the points (-3,8) and (5,2). (State your answer in general form.)
   d) Having an x-intercept of 4 and a y-intercept of -2. (slope-point form please)
   e) Perpendicular to the y- axis and having a y-intercept of 3. (general form please)

2. a) The equation $4x+3y+10=0$ is in general form, rearrange it so it is in slope-intercept form.
   b) The equation $y-8=\frac{3}{5}(x-11)$ is in slope-point form, rearrange it so it is in slope-intercept form.

3. 

   a) Determine the equation of the indicated line.
   (general form please)
   Hint: Keep an eye on the values of the axes.

x_1, y_1 $(-4,7)$ + x_2, y_2 $(-2,0)$

(i) Slope

$m=\frac{0-7}{-2-(-4)}$

$m=\frac{-7}{2}$

(ii) Point

$(-4,7)$

$x_1=-4$

$y_1=7$

(iii) Equation:

$y-y_1=m(x-x_1)$

$y-7=\frac{-7}{2}(x-(-4))$

$y-7=-\frac{7}{2}(x+4)$

$2\cdot y-7=2\cdot-\frac{7}{2}x-2\cdot\frac{28}{2}$

$2y-14=-7x-28$

$7x+2y-14+28=0$

$7x+2y+14=0$

① a) Determine the equation of a line Parallel to $5y = 10 - 3x$ and passing through $(-2, 7)$

$x_1 = -2$

$y_1 = 7$

① Determine Slope

$5y = 10 - 3x$

$\frac{5y}{5} = \frac{-3x}{5} + \frac{10}{5}$

$y = \frac{-3}{5}x + 2$

$m = -\frac{3}{5}$

$m_{\parallel} = -\frac{3}{5}$

② Determine Point:

$(-2, 7)$

$x_1 = -2$

$y_1 = 7$

Determine equation

$y - y_1 = m(x - x_1)$

$y - 7 = \frac{-3}{5}(x - (-2))$

$y - 7 = \frac{-3}{5}(x + 2)$

Determine the equation of a line . . .

① b) Perpendicular to $6x = 3y + 9$ and have an x-intercept of 7 (Answer in general form)

(I) Find Slope:

$6x = 3y + 9$

$\frac{-3y}{-3} = \frac{-6x}{-3} + \frac{9}{-3}$

$y = 2x - 3$

$m = 2$

$m_1 = -\frac{1}{2}$

(II) Find Point

x-intercept = 7

(7, 0)

$x_1 = 7$

$y_1 = 0$

(III) Find equation

$y - y_1 = m(x - x_1)$

$y - 0 = -\frac{1}{2}(x - 7)$

2. $y = -\frac{1}{2}x + \frac{7}{2}$

$2y = -1x + 7$

$x + 2y - 7 = 0$

Determine the equation of a line . . .

① c) Passing through the points $(-3,8)$ and $(5,2)$ (x_1,y_1 and x_2,y_2)
(Answer in general form)

(i) Find slope

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m = \frac{2-8}{5-(-3)}$$

$$m = \frac{-6}{8} = \frac{-3}{4}$$

(ii) Point

$(-3,8)$

$x_1 = -3$

$y_1 = 8$

(iii) Find equation:

$$y - y_1 = m(x - x_1)$$

$$y - 8 = \frac{-3}{4}(x - (-3))$$

$$y - 8 = \frac{-3}{4}(x + 3)$$

$$4 \cdot y - 8 = 4 \cdot \frac{-3x}{4} - 4 \cdot \frac{9}{4}$$

$$4y - 32 = -3x - 9$$

$$3x + 4y - 32 + 9 = 0$$

$$\boxed{3x + 4y - 23 = 0}$$

Determine the equation of a line . . .

① a) Having an x-intercept of 4 (x_1, y_1 $(4,0)$) and a y-intercept of -2 (x_2, y_2 $(0,-2)$)
(Answer in Slope Point form)

(i) Find slope:

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m = \frac{-2-0}{0-4}$$

$$m = \frac{-2}{-4} = \frac{1}{2}$$

(ii) Point:

$(4,0)$

$x_1 = 4$

$y_1 = 0$

(iii) Equation:

$$y - y_1 = m(x - x_1)$$

$$\boxed{y - 0 = \frac{1}{2}(x - 4)}$$

Determine the equation of a line . . .

① e) Perpendicular to the y-axis and having a y-intercept of 3 (Answer in general form)

(i) Slope:

Slope of y-axis $= \frac{1}{0}$

$m = \frac{1}{0}$

$m_{\perp} = \frac{0}{-1} = 0$

(ii) Point:

y-intercept = 3

(0, 3)

$x_1 = 0$

$y_1 = 3$

(iii) Equation:

$y - y_1 = m(x - x_1)$

$y - 3 = 0(x - 0)$

$y - 3 = 0 - 0$

$y - 3 = 0$

② a) $4x+3y+10=0$ (General form)

$\frac{3y}{3} = \frac{-4x}{3} - \frac{10}{3}$

$\boxed{y = -\frac{4}{3}x - \frac{10}{3}}$ (Slope Intercept form)

$m = -\frac{4}{3}$ (slope)

$b = -\frac{10}{3}$ (y-intercept)

② b) $y - 8 = \frac{3}{5}(x - 11)$ (Slope-Point form)

$y - 8 = \frac{3}{5}x - \frac{33}{5}$

$y = \frac{3}{5}x - \frac{33}{5} + \frac{8}{1}$ (get a common denominator)

$y = \frac{3}{5}x - \frac{33}{5} + \frac{40}{5}$

$\boxed{y = \frac{3}{5}x + \frac{7}{5}}$ (Slope Intercept Form)

$m = \frac{3}{5}$

$b = \frac{7}{5}$