Worksheet 2015-10ŒG-00005(1) Equation of the straight line

(1) Determine the equations of the following straight lines:

(a) through the coordinate $(0 ; -2)$ with gradient 2. ($x=0$, c; gradient $\rightarrow m$)

$y = mx + c$

$\therefore y = 2x - 2$

(b) through the origin parallel to $y = x + 1$.

$(0;0)$ $\quad m_1 = 1$

$\therefore \quad m_2 = 1 \rightarrow$ lines are //

$\therefore y = mx + c$

$y = 1x + 0$

$y = x$

(c) through the coordinates $(-1 ; 3)$ and $(2 ; 5)$. (x_1, y_1 and x_2, y_2)

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

$= \frac{5 - 3}{2 - (-1)}$

$= \frac{2}{3}$

$\therefore y = mx + c$

$y = \frac{2}{3}x + c$ substitute $(-1; 3)$ (x, y)

$3 = \frac{2}{3}(-1) + c$

$\therefore c = 3\frac{2}{3}$

$\therefore y = \frac{2}{3}x + 3\frac{2}{3}$

(d) through the coordinate $(3 ; 0)$ perpendicular to $y = -x - 3$. (x, y)

$\therefore m_1 = -1$

$\therefore m_2 = +1 \rightarrow$ lines $\perp$ $\therefore m_1 \times m_2 = -1$

$y = mx + c$

$y = 1x + c$ substitute $(3; 0)$ (x; y)

$0 = 1(3) + c$

$\therefore c = -3 \rightarrow \therefore y = x - 3$

(e) perpendicular to $2y + 4 = x$ through $(0 ; -2)$. → c

$2y = x - 4$

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

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

$\perp \Rightarrow m_2 = -2$

$\therefore y = mx + c$

$\therefore y = -2x - 2$

(f) through the coordinates $(2 ; 4)$ and $(-1 ; 4)$. $x_1\ y_1$ $x_2\ y_2$ → $\therefore y = 4$

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

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

$= \frac{0}{-3}$

$m = 0$

$\therefore y = mx + c$

$\therefore 4 = 0(2) + c$

$\therefore c = 4$

$\therefore y = 0x + 4$

$\therefore y = 4$

(g) parallel to $2x + 2y = 6$ through $(2 ; 3)$. $x\ y$

$2y = -2x + 6$

$y = -1x + 3$

$\therefore m_1 = -1$

$\therefore m_2 = -1$

→ lines //

$y = mx + c$

$y = -1x + c$

$3 = -1(2) + c$

$\therefore c = 5$

$\therefore y = -x + 5$

(h) through the coordinates $(6 ; 3)$ and $(0 ; 1)$. $x_1\ y_1$ $x_2\ y_2$ → $c = 1$

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

$= \frac{1 - 3}{0 - 6}$

$= \frac{-2}{-6}$

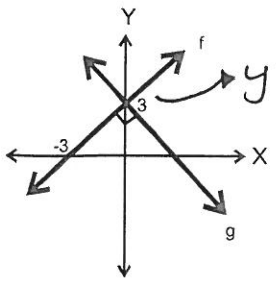
$= \frac{1}{3}$

$\therefore y = mx + c$

$\therefore y = \frac{1}{3}x + 1$

(2) Determine the equations of f, g, h and j in each of the following scketches:

(a)



y-intercept $\therefore c = 3$

through $(\overset{x_1}{-3};\overset{y_1}{0})$ and $(\overset{x_2}{0};\overset{y_2}{3})$

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

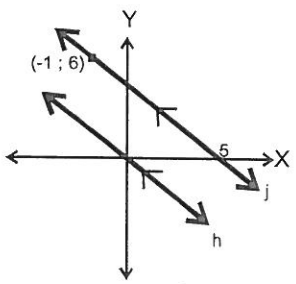
$m = \frac{3-0}{0-(-3)} = \frac{3}{3} = 1$

$\therefore f(x) = 1x + 3$

For g: $m = -1$ (lines $\perp$)

$\therefore g(x) = -1x + 3$

(b)



through $(\overset{x_1}{-1};\overset{y_1}{6})$ and $(\overset{x_2}{5};\overset{y_2}{0})$

$j: m = \frac{0-6}{5-(-1)} = \frac{-6}{6} = -1$

$\therefore y = -1x + c$

$6 = -1(-1) + c$

$\therefore c = 5$

$\therefore j(x) = -x + 5$

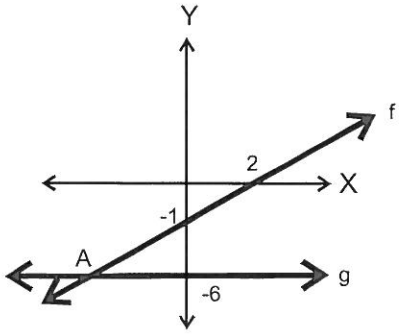
$\therefore h(x) = -x + 0$

$\rightarrow$ lines $\parallel$

(3) (a) Determine the equations of f and g.

(b) Calculate, algebraically, the coordinates of A.

(c) Determine the equation of h in the form
h : $x \rightarrow$ ..... if h $\perp$ f through the point A.



(a) f: through $(\overset{x_1}{2};\overset{y_1}{0})$ and $(\overset{x_2}{0};\overset{y_2}{-1})$ C

$\therefore m = \frac{-1-0}{0-2} = \frac{-1}{-2} = \frac{1}{2}$

$\therefore f(x) = y = \frac{1}{2}x - 1$

$g(x) = y = -6$

(b) Simultaneous solution: $\frac{1}{2}x - 1 = -6$

$\frac{1}{2}x = -5$

$x = -10$

$\therefore A(-10; -6)$

lines $\perp \rightarrow m_1 \times m_2 = -1$

(c) $m_f = \frac{1}{2} \rightarrow \therefore m_h = -2$

$y = -2x + c$ through $A(-10; -6)$

$-6 = -2(-10) + c$

$\therefore c = -26$

$\therefore h(x) = -2x - 26$