

13. Write down the equation of any line parallel to $4x + 3y + 1 = 0$.

Hence find the equations of the two lines which are parallel to the line $4x + 3y + 1 = 0$ and two units from it.

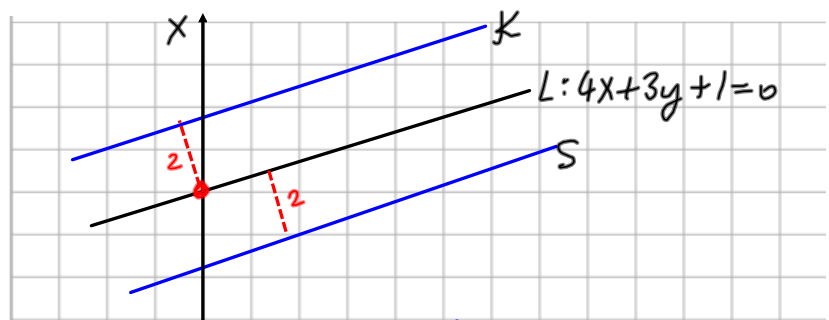
equation parallel line is

$$4x + 3y + k = 0$$

Point on L?

$$d = \frac{|ax_1 + by_1 + c|}{\sqrt{a^2 + b^2}}$$

distance $(0, -\frac{1}{3})$ to K?



$$x=0, y=? \quad 4(0) + 3y + 1 = 0$$

$$3y = -1, \quad y = -\frac{1}{3}$$

$$\Rightarrow \text{pt } (0, -\frac{1}{3})$$

$$\frac{|4(0) + 3(-\frac{1}{3}) + k|}{\sqrt{4^2 + 3^2}} = 2$$

$$\Rightarrow \frac{|-1 + k|}{5} = 2 \Rightarrow |1 + k| = 10$$

either
or

$$-1 + k = 10 \Rightarrow k = 11$$

$$-1 + k = -10 \Rightarrow k = -9$$

Lines: {

$$K: 4x + 3y - 9 = 0$$

$$S: 4x + 3y + 11 = 0$$

HW. Q14, Q17

14. Write down the equation of any line that is perpendicular to the line $3x - 4y + 5 = 0$. :L
Now find the equations of the two lines which are perpendicular to the line $3x - 4y + 5 = 0$, if the perpendicular distance from the point $(1, 1)$ to each line is 4 units.

$$L: ax + by + c = 0$$

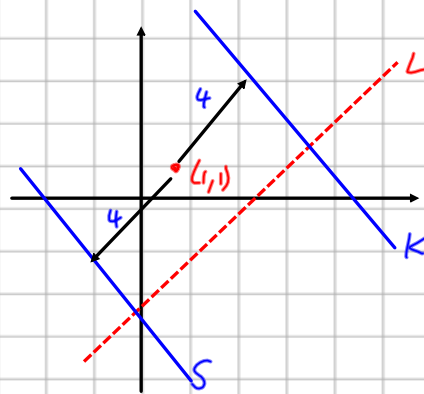
$$L: -bx + ay + k = 0$$

$$d = \frac{|ax_1 + by_1 + c|}{\sqrt{a^2 + b^2}}$$

$$a = 4, b = 3$$

$$\text{pt } (1, 1), d = 4$$

$$L \text{ to } L \Rightarrow 4x + 3y + k = 0 \quad \checkmark$$



$$\frac{|4(1) + 3(1) + k|}{\sqrt{4^2 + 3^2}} = 4$$

$$|7 + k| = 20 \quad \text{either } 7 + k = 20 \quad k = 13$$

$$\text{OR } 7 + k = -20 \quad k = -27$$

$$S: 4x + 3y + 13 = 0$$

$$K: 4x + 3y - 27 = 0$$

15. Write down the equation of any line through the point $(-4, 2)$.
Hence find the equations of the two lines through the point $(-4, 2)$ whose perpendicular distance from the origin is 2.

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

$$d = \frac{|ax_1 + by_1 + c|}{\sqrt{a^2 + b^2}}$$

pt $(0,0)$ $d=2$

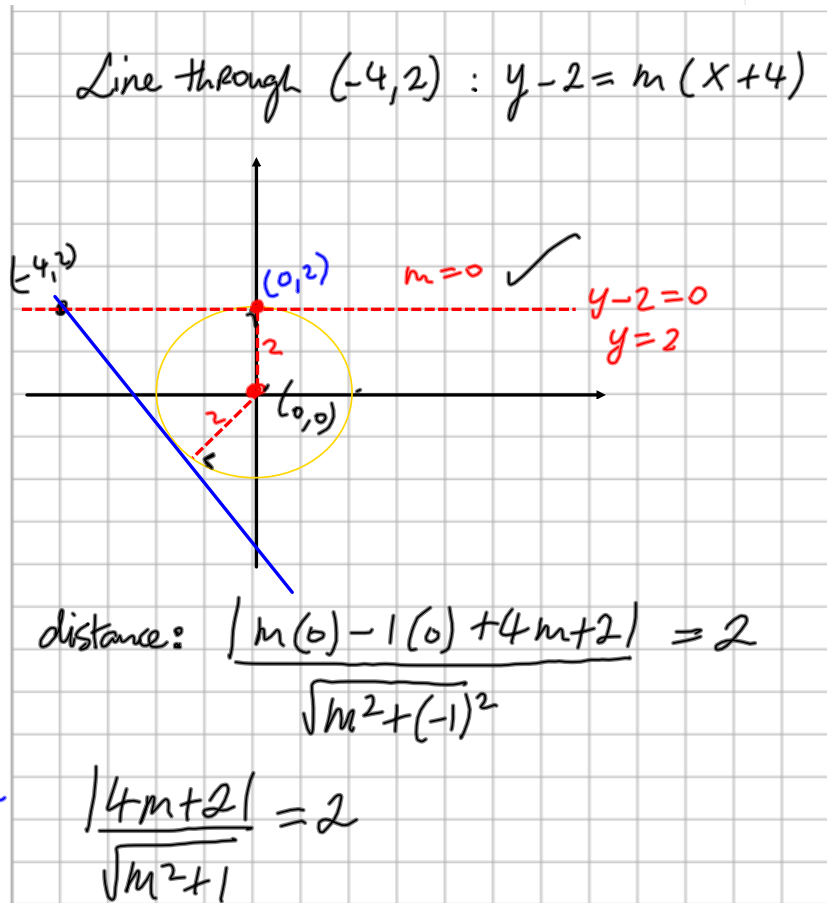
$$y - 2 = m(x + 4)$$

$$y - 2 = mx + 4m$$

$$ax + by + c = 0$$

$$mx - y + (4m + 2) = 0$$

$$a = m \quad b = -1 \quad c = 4m + 2$$



$$|4m + 2| = 2\sqrt{m^2 + 1} \Rightarrow |2m + 1| = \sqrt{m^2 + 1}$$

$$\Rightarrow (2m + 1)^2 = m^2 + 1 \Rightarrow 4m^2 + 4m + 1 = m^2 + 1$$

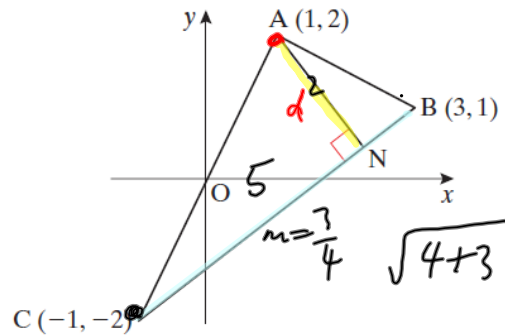
$$\Rightarrow 3m^2 + 4m = 0 \Rightarrow m(3m + 4) = 0$$

$$\Rightarrow m = 0 \quad \text{OR} \quad 3m + 4 = 0$$

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

.....

17. The vertices of a triangle are the points A(1, 2), B(3, 1) and C(-1, -2).
 (i) Find the length of the perpendicular from A to BC, i.e., find |AN|.
 (ii) Hence find the area of the triangle ABC.



line [BC]?

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

$$d = \frac{|ax_1 + by_1 + c|}{\sqrt{a^2 + b^2}}$$

$$a=3 \quad b=4 \quad c=-5$$

pt(1, 2)

$$m = \frac{y_2 - y_1}{x_2 - x_1} \quad m_{BC} = \frac{1 - (-2)}{3 - (-1)} = \frac{3}{4}$$

$$\text{line [BC]} \quad y - (-2) = \frac{3}{4}(x - (-1))$$

$$4(y + 2) = 3(x + 1)$$

$$4y + 8 = 3x + 3$$

$$3x - 4y - 5 = 0$$

$$d = \frac{|3(1) - 4(2) - 5|}{5} = \frac{|11|}{5}$$

$$d = 2$$