CNHS Higher HW Solutions
Week 1 [08/02/19]
Qs 1 - 12

1. Given the points A(–2, 1), B(4, 9) and C(–6, –1), use the distance formula to calculate the lengths of AB and AC.

$$AB = \sqrt{(4+2)^2 + (9-1)^2} = \sqrt{6^2 + 8^2} = \sqrt{100} = 10$$
$$AC = \sqrt{(-2+6)^2 + (1+1)^2} = \sqrt{4^2 + 2^2} = \sqrt{20} = 2\sqrt{5}$$

2. The line joining the points (–2, –3) and (6, k) has gradient $\dfrac{2}{3}$.

   What is the value of k?

$$\frac{k+3}{6+2} = \frac{k+3}{8} = \frac{2}{3} \quad \ldots\ldots\ldots k+3 = \frac{16}{3} \quad \ldots\ldots k = \frac{16}{3} - 3 = \frac{16}{3} - \frac{9}{3} = \frac{7}{3}$$

3. Use gradients to prove that the points A(–2, –1), B(4, 3) and C(16, 11) are collinear.

$$mAB = \frac{3+1}{4+2} = \frac{4}{6} = \frac{2}{3} \qquad mAC = \frac{11+1}{16+2} = \frac{12}{18} = \frac{2}{3}$$
mAB = mAC and common point A => points A,B, and C are collinear.

4. (a) Find the gradient of the straight line joining the points A(–1, 0) and B(3, 8).

   (b) Hence calculate the size of the angle that the line AB makes with the positive direction of the x-axis.

$$m = \frac{8-0}{3+1} = \frac{8}{4} = 2 \qquad m = \tan\theta = 2 \ldots \theta = \tan^{-1}(2) = 63.4^\circ$$

5. Line L has equation $2x + y = 8$.

   (a) What is the gradient of line L?

   (b) Find the equation of the line parallel to L which passes through the point (3, 1).

$$y = -2x + 8 \ldots m = -2$$
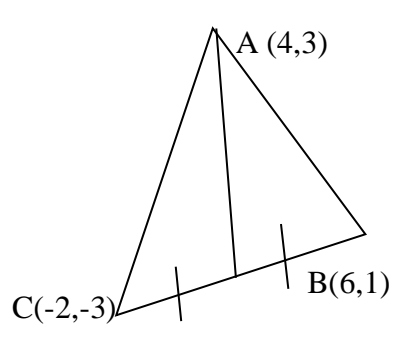$$y - 1 = -2(x-3) \ldots y - 1 = -2x + 6 \ldots y = -2x + 7$$

6. Find the equation of the perpendicular bisector of the line AB, where A is the point (2, –1) and B is (8, 3).

$$mAB = \frac{3+1}{8-2} = \frac{4}{6} = \frac{2}{3} \Rightarrow mperp = \frac{-3}{2} \qquad y - 1 = \frac{-3}{2}(x - 5)$$
midpt (5,1)
$$2y - 2 = -3(x - 5)$$
$$2y - 2 = -3x + 15$$

3x+2y=17 or equivalent

7.　(a)　Sketch triangle ABC with vertices A(4, 3), B(6, 1) and C(−2, −3).

(b)　Find the equation of the median from A.

midptBC=(2,-1)

$$m_{MEDIAN}=\frac{3+1}{4-2}=\frac{4}{2}=2$$

A (4,3)

C(-2,-3)

B(6,1)

y+1=2(x-2)
y+1=2x-4
y - 2x = - 5 or equivalent

8.　Find the equation of the line which passes through the point (−1, 3) and is perpendicular to the line with equation $4x + y - 1 = 0$.

y = - 4x + 1…m= - 4 => $m_{PERP}=\frac{1}{4}$ and pt (-1,3)

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

4y-12=1(x+1)
4y-12=x+1
4y - x=13 or equivalent

9.　Given that the points A(−1, 0), B(1, 3) and C(5, k) are collinear, find the value of k.

$$mAB=\frac{3-0}{1+1}=\frac{3}{2} \quad mAC=\frac{k-0}{5+1}=\frac{k}{6}=\frac{3}{2}.......k=\frac{18}{2}=9$$

10.　A and B are the points (−3, −1) and (5, 5) respectively.

(a)　Find the equation of the line AB.

(b)　Find the equation of the perpendicular bisector of AB.

$mAB=\frac{5+1}{5+3}=\frac{6}{8}=\frac{3}{4}$ and pt (5,5)…y-5=$\frac{3}{4}$ (x-5)…4y-20=3(x-5)…4y-20=3x-15…**4y - 3x = 5**

or eq.

midpt (1,2) and $m_{PERP}=\frac{-4}{3}$ …y-2=$\frac{-4}{3}$ (x-1)…3y-6= - 4(x-1)...3y-6= - 4x+4...**3y + 4x = 10** or eq.

11. The line L passes through the point (−2, −1) and is parallel to the line with equation $5x + 3y − 6 = 0$. Find the equation of line L in the form $ax + by + c = 0$.

5x+3y-6=0...3y= - 5x+6...y=$\dfrac{-5}{3}$ x + 2 ...m=$\dfrac{-5}{3}$...mL = $\dfrac{-5}{3}$ AND point (-2,-1)

y+1=$\dfrac{-5}{3}$ (x+2)...3y+3=-5(x+2)...3y+3=-5x-10...**5x+3y+13=0**

12. (a) Find the equation of the straight line joining the points A(−3, 0) and B(5, 4).

(b) The line makes an angle of $a°$ with the positive direction of the x-axis. Find the value of a correct to 1 decimal place.

m=$\dfrac{4-0}{5+3}$=$\dfrac{4}{8}$=$\dfrac{1}{2}$ and pt (-3,0)...y-0=$\dfrac{1}{2}$ (x+3)...**y**=$\dfrac{1}{2}$ **x**+$\dfrac{3}{2}$

m=tanθ=$\dfrac{1}{2}$ ...θ=tan^{-1}($\dfrac{1}{2}$)=**26.6°**