

H.W
3/8/21

Coordinate Geometry

1) $(2, 0), (2, 3)$

$$\begin{aligned} \text{Distance} &= \sqrt{(2-2)^2 + (0-3)^2} \\ &= \sqrt{0+9} = 3 \end{aligned}$$

2) $P(1, 4), Q(4, 0)$

$$\text{Distance} = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$PQ = \sqrt{(1-4)^2 + (4-0)^2}$$

$$= \sqrt{(-3)^2 + (4)^2} = 5$$

3) Area of triangle = $\frac{1}{2}(x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2))$

$$= \frac{1}{2}(-5(P - (-2)) + 1(-2 - (-1)) + 4(1 - P))$$

$$= \frac{1}{2}(-5(P + 2) + 1(-3) + 4(1 - P))$$

$$= \frac{1}{2}(-5P - 10 - 3 + 4 - 4P)$$

$$= \frac{1}{2}(-5 - 9 - 4p) = 0 = 0$$

$$= \frac{1}{2}(-9p - 9) = 0 = 0$$

$$\Rightarrow 9p + 9 = 0$$

$$p = -1$$

$$4) A(x_2, y_2) = A(a+b, b-a)$$

$$B(x_2, y_2) = B(a-b, a+b)$$

$$|AB|^2 = (x_1 - x_2)^2 + (y_1 - y_2)^2$$

$$((a+b) - (a-b))^2 + ((b-a) - (a+b))^2$$

$$(2b)^2 - (-2a)^2$$

$$4b^2 - 4a^2 = 4(a^2 - b^2)$$

$$AB = \sqrt{4(a^2 - b^2)}$$

$$= 2\sqrt{a^2 - b^2}$$

$$5) \text{ Distance} = \sqrt{(x-3)^2 + (-1-2)^2} = 5$$

$$\Rightarrow \sqrt{(x-3)^2 + 9} = 5$$

$$\Rightarrow (x-3)^2 + 9 = 25$$

$$\Rightarrow (x-3)^2 = 16$$

$$x - 3 = \pm 4$$

$$x = 7 \text{ or } x = -1$$

Edo.

$$6) A(1, 1), (-2, 7) \& (3, -3)$$

$$A = (1, 1) = (x_1, y_1)$$

$$B = (-2, 7) = (x_2, y_2)$$

$$C = (3, -3) = (x_3, y_3)$$

By distance formula,

$$\sqrt{(x_3 - x_2)^2 + (y_3 - y_2)^2} = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} + \sqrt{(x_3 - x_1)^2 + (y_3 - y_1)^2}$$

$$\sqrt{(3 - (-2))^2 + (-3 - 7)^2} = \sqrt{(-3)^2 + (6)^2} + \sqrt{(2)^2 + (-4)^2}$$

$$\sqrt{25 + 100} = \sqrt{9 + 36} + \sqrt{4 + 16}$$

$$\sqrt{125} = \sqrt{45} + \sqrt{20}$$

$$5\sqrt{5} = 3\sqrt{5} + 2\sqrt{5}$$

$$5\sqrt{5} = 5\sqrt{5}$$

So, they are collinear.

$$7) \frac{x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)}{2}$$

$$(x_1, y_1) = (1, 2)$$

$$(x_2, y_2) = (0, 0)$$

$$(x_3, y_3) = (a, b)$$

$$\frac{1(0 - b) + 0(a - 1) + a(2 - 0)}{2} = 0$$

$$-b + 2a = 0$$

$$2a = b$$

8) Area of $\Delta ABC = 0$

$$\frac{1}{2} (x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)) = 0$$

$$x_1 = 2, y_1 = 3$$

$$x_2 = 4, y_2 = k$$

$$x_3 = 6, y_3 = -3$$

$$\Rightarrow \frac{1}{2} (2(k - (-3)) + 4(-3 - 3) + 6(3 - k)) = 0$$

$$\Rightarrow 2(k + 3) + 4(-6) + 6(3 - k) = 0 \times 2$$

$$\Rightarrow 2k + 6 - 24 + 18 - 6k = 0$$

$$\Rightarrow 2k - 6k = -6 + 24 - 18$$

$$\Rightarrow -4k = 0$$

$$\Rightarrow k = 0$$

9) Point of origin = $(x_1, y_1) = (0, 0)$

Another point = $(x_2, y_2) = (-3, 4)$

$$d = \sqrt{(-3 - 0)^2 + (4 - 0)^2}$$

$$= \sqrt{(-3)^2 + (4)^2}$$

$$\sqrt{9 + 16} = \sqrt{25} = 5$$

10)

$$AB = \sqrt{(-2 - 1)^2 + (3 - 2)^2} = \sqrt{9 + 1} = \sqrt{10}$$

$$BC = \sqrt{(-2 - 3)^2 + (3 + 4)^2}$$

$$= \sqrt{25 + 49} = \sqrt{74}$$

$$AC = \sqrt{(1 + 3)^2 + (2 + 4)^2} = \sqrt{16 + 36} = \sqrt{54}$$

