

March 10

Recall: Use the midpoint formula to find the midpoint of the points $A(1, -6)$ and $B(3, 0)$

$$M_{AB} \left(\frac{1+3}{2}, \frac{-6+0}{2} \right) \rightarrow M_{AB} (2, -3)$$

Recall: Find the slope of a line perpendicular to $y = -3x + 2$

$$m = -\frac{3}{1} = -\frac{1}{-3} \text{ (flip and add } \ominus) = \frac{1}{3}$$

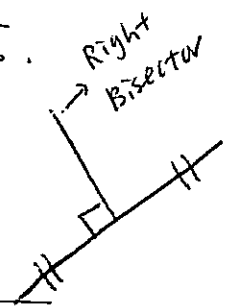
Definitions:

Equidistant - equal distance

\therefore The slope is $\frac{1}{3}$.

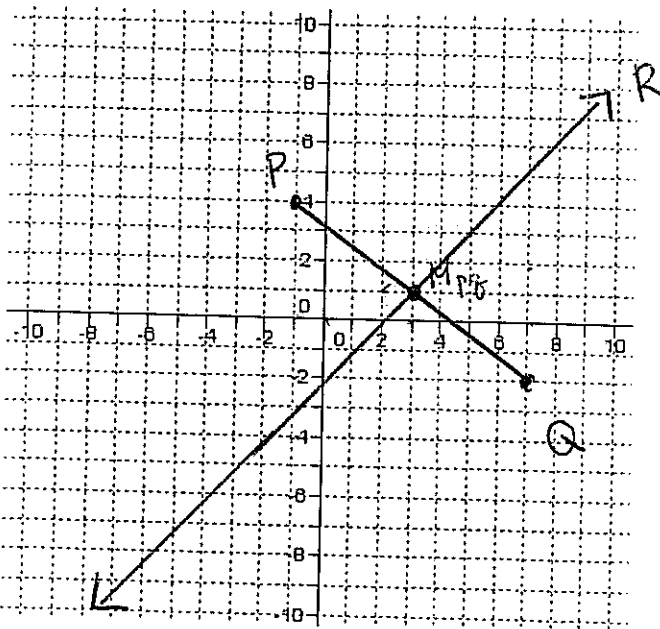
Right Bisector - the line that passes through the midpoint of a line segment and intersects it at a 90° angle.

Sometimes called perpendicular bisector



Example 3: Equation of a Right Bisector

Two schools are located at the points $P(-1, 4)$ and $Q(7, -2)$. The school board is planning a new sports complex to be used by both schools. The board wants to find a location equidistant from the two schools. Use an equation to represent the possible locations for the sports complex.



$$\begin{aligned} M \text{ of } \overline{PQ} &= \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right) \\ &= \left(\frac{-1 + 7}{2}, \frac{4 - 2}{2} \right) \\ &= (3, 1) \end{aligned}$$

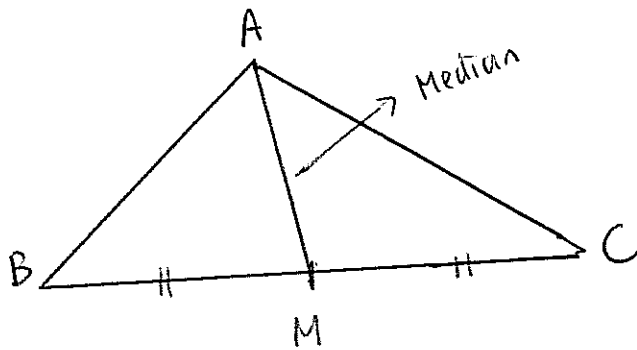
$$\begin{aligned} \text{slope of } PQ &= \frac{y_2 - y_1}{x_2 - x_1} \\ &= \frac{-2 - 4}{7 - -1} \\ &= \frac{-6}{8} = -\frac{3}{4} \end{aligned}$$

$$\text{slope of } R = -\left(-\frac{3}{4}\right) = \frac{4}{3}$$

$$\text{Equation of } R \Rightarrow y = \frac{4}{3}x + b \leftarrow \text{sub } x=3 \text{ and } y=1 \quad \therefore y = \frac{4}{3}x - 3$$

$$1 = \left(\frac{4}{3} \times 3\right) + b \rightarrow 1 = 4 + b \rightarrow -3 = b$$

What is the difference between a midpoint and a median? (Draw a picture and explain.)

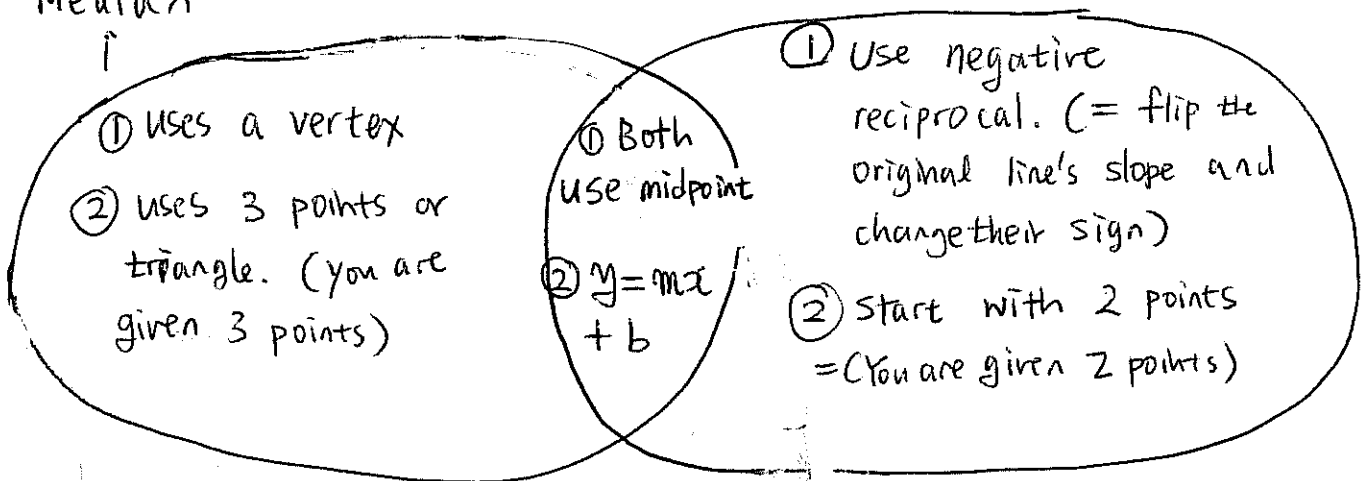


Midpoint is a point in the middle.
Median connects midpoint and a vertex of a triangle.

What are the similarities and differences between finding the equations of medians and perpendicular bisectors? (Draw a picture and explain.)

Median
↓

Right Bisector



HW P174 #15

Practice:

same

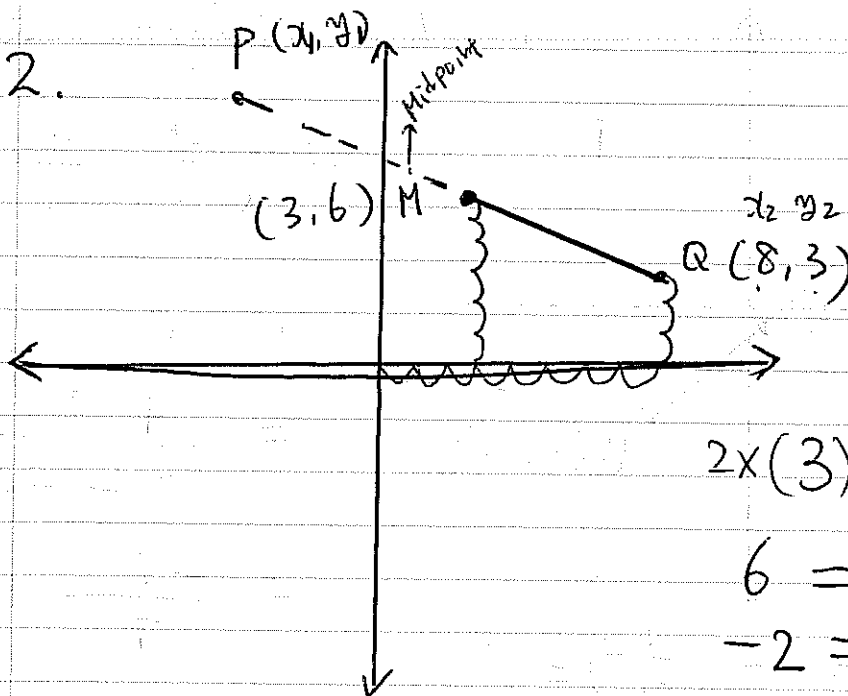
1. Find the perpendicular bisector of the points $A(-4, 3)$ and $B(3, -4)$.
2. Find the perpendicular bisector of the points $P(-1, 4)$ and $Q(3, -2)$.
3. Find the equation of the perpendicular bisector of a chord of a circle, given that the end points of the chord are $C(-2, 0)$ and $D(4, -4)$.

Answers: 1. $y = x$

2. $y = \frac{2}{3}x + \frac{1}{3}$

3. $y = \frac{3}{2}x - \frac{7}{2}$

#2.



$$M = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

$$M = (3, 6)$$

$$2x(3) = \left(\frac{x_1 + 8}{2} \right) \times 2$$

$$6 = x_1 + 8$$

$$-2 = x_1$$

$$2x(6) = \left(\frac{y_1 + 3}{2} \right) \times 2$$

$$12 = y_1 + 3$$

$$12 - 3 = y_1$$

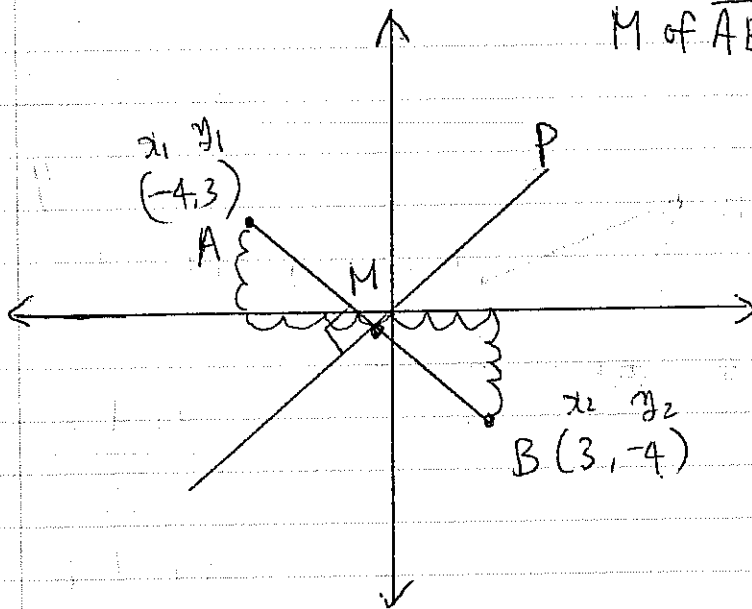
$$9 = y_1$$

$$\therefore P = (-2, 9)$$

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Practice

#1



$$M \text{ of } \overline{AB} = \left(\frac{-4+3}{2}, \frac{3+(-4)}{2} \right)$$

$$= \left(\frac{-1}{2}, \frac{-1}{2} \right)$$

$$\text{slope } \overline{AB} = \frac{-4-3}{3-(-4)}$$

$$= \frac{-7}{7} = -1$$

$$\text{slope of } P = -\left(-\frac{1}{-1}\right) = 1$$

$$y = x + b \quad \text{sub } x = -\frac{1}{2}, y = -\frac{1}{2}$$

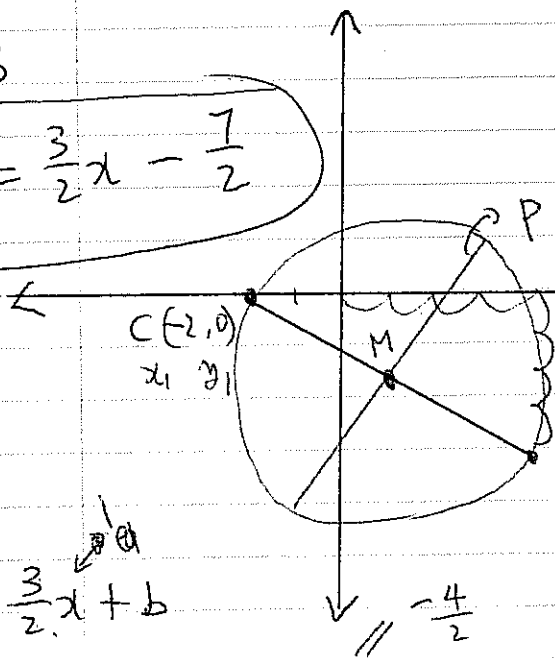
$$-\frac{1}{2} = -\frac{1}{2} + b \quad \therefore P \Rightarrow y = x$$

$$-\frac{1}{2} + \frac{1}{2} = b \quad \therefore \text{Perpendicular bisector of } \overline{AB}$$

$$0 = b \quad \text{is } y = x$$

#3

$$\therefore y = \frac{3}{2}x - \frac{7}{2}$$



$$M \text{ of } \overline{CD} = \left(\frac{-2+4}{2}, \frac{0+(-4)}{2} \right)$$

$$= \frac{2}{2}, -2 = (1, -2)$$

$$\text{slope } \overline{CD} = \frac{-4-0}{4-(-2)} = \frac{-4}{6}$$

$$\text{slope } \overline{CD} = -\frac{2}{3}$$

$$\text{slope } P = -\left(-\frac{3}{2}\right)$$

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

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

$$-2 = \frac{3}{2} + b \rightarrow -2 - \frac{3}{2} = b \rightarrow b = \frac{-4-3}{2} = -\frac{7}{2}$$