

MATH 1650: SECTION A.3: DISTANCE AND MIDPOINT FORMULAS

THE DISTANCE FORMULA: The distance d between the points $P(x_0, y_0)$ and $Q(x_1, y_1)$ is:

$$d = \sqrt{(x_1 - x_0)^2 + (y_1 - y_0)^2}$$

SKETCH OF PROOF:



QUESTION: Do you remember what result relates the lengths of the sides of a right triangle? How can this be used to derive the distance formula?

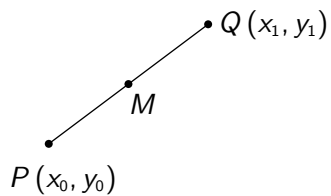
EXAMPLE: Find and simplify the distance between the following sets of points:

1. $P(-2, 3)$ and $Q(1, -3)$

2. $R\left(\frac{1}{2}, \frac{2}{3}\right)$ and $S\left(\frac{3}{4}, \frac{1}{5}\right)$.

MIDPOINT FORMULA: The midpoint M of the line segment connecting $P(x_0, y_0)$ and $Q(x_1, y_1)$ is:

$$M = \left(\frac{x_0 + x_1}{2}, \frac{y_0 + y_1}{2} \right) = (\text{average of the } x \text{ coordinates, average of the } y \text{ coordinates.})$$



EXAMPLE: Find the midpoint of the line segment connecting the following pairs of points:

1. $P(-2, 3)$ and $Q(1, -3)$

2. $R(\frac{1}{2}, \frac{2}{3})$ and $S(\frac{3}{4}, \frac{1}{5})$

HOMEWORK: Section A.3: 3 - 19 odd.