

Question 1

Determine the equation of the line that passes through point $(-1, 5)$ and is perpendicular to the line whose equation is :

$$m_1 = -\frac{1}{m_2}$$

$$5x + \frac{3y}{2} - 4 = 0$$

Clearly show all your work.

$$m_1 = -\frac{10}{3}$$

$$\frac{3y}{2} = -5x + 4$$

$$y = -\frac{10}{3}x + \frac{8}{3}$$

$$m_2 = -\frac{1}{m_1} = -\frac{1}{-\frac{10}{3}} = \frac{3}{10}$$

$$P(-1, 5)$$

$$m_2 = \frac{y - y_1}{x - x_1}$$

$$\frac{3}{10} = \frac{y - 5}{x - (-1)}$$

$$10(y - 5) = 3(x + 1)$$

$$10y - 50 = 3x + 3$$

$$-3x + 10y - 50 - 3 = 0$$

$$-3x + 10y - 53 = 0$$

Question 2

Determine the equation of the line that passes through the point (3, -2) and is parallel to the line whose equation is:

$$m_1 = m_2$$

Clearly show all your work.

$$m_1 = m_2 = -\frac{1}{2}$$

$$P(3, -2) \rightarrow (x, y)$$

$$y = mx + b$$

$$-2 = -\frac{1}{2}(3) + b$$

$$-2 = -\frac{3}{2} + b$$

$$-2 + \frac{3}{2} = b = -\frac{1}{2}$$

$$x + 2y = 3$$

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

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

$$m_1 = -\frac{1}{2}$$

$$y = -\frac{1}{2}x - \frac{1}{2}$$

Question 3

Determine the equation of the line that passes through the point $(-0.75, 1.25)$ and is parallel to the line whose equation is:

$$m_1 = m_2$$

Clearly show all your work.

$$-2y - 3 = 0$$

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

$$y = -\frac{3}{2} \leftarrow \text{Horizontal!}$$

$$m_1 = 0$$

Since $L_1 \parallel L_2 \rightarrow L_2$ must also be Horizontal!

$$y = b$$

$$y = 1.25$$

Question 4

Given the following four equations:

$$l_1: x + 3y = 2$$

$$l_2: 6x = 2y - 3$$

$$l_3: 2y = 8$$

$$l_4: y = 3x + 4$$

$$L_1: \frac{3y}{3} = \frac{-x+2}{3} \rightarrow y = -\frac{1}{3}x + \frac{2}{3}$$

$$L_2: \frac{6x+3}{2} = \frac{2y}{2} \rightarrow y = 3x + \frac{3}{2}$$

$$L_3: \frac{2y}{2} = \frac{8}{2} \rightarrow y = 4$$

$$L_4: y = 3x + 4$$

- a) Determine if l_1 is perpendicular to l_2 .

Clearly show all your work.

$$m_1 \times m_2 = -1$$

$$-\frac{1}{3} \times 3 = -\frac{3}{3} = -1$$

Yes they are!

Concurrent: Intersecting

- b) Find a line that is parallel to l_2 .

Clearly show all your work.

$$m_1 = m_2$$

$$m_2 = 3$$

$$m_4 = 3$$

$L_4 \parallel L_2$

Coincident: Same exact equation

- c) Determine which line shares a common y-intercept with line l_3 .

Clearly show all your work.

$$l_3: (0, 4)$$

$$L_4: (0, 4)$$

L_4 shares its y-int with l_3 .

Question 5

Calculate the distance between points A ¹(-3, 4) and B ²(6, -9). Round off your answer to the nearest hundredth if necessary. Show all your work.

$$\begin{aligned}d &= \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \\&= \sqrt{(6 - (-3))^2 + (-9 - 4)^2} \\&= \sqrt{9^2 + (-13)^2} \\&= \sqrt{81 + 169} \\&= \sqrt{250} \\&= 15.811 \\&= 15.81 \text{ units}\end{aligned}$$

Question 6

The following expressions represent the distance between two points:

$$1) \sqrt{(-2-4)^2 + (-5-7)^2}$$

$$2) \sqrt{(5+2)^2 - (-1+5)^2}$$

$$3) |-2-5|$$

$$4) \sqrt{(5+2)^2 + (-1+5)^2}$$

$$5) \sqrt{(5-4)^2 + (-1-7)^2}$$

Points A (4, 7), B (-2, -5) and C (5, -1) were used to define the segments below.

Determine which expression(s) correspond(s) to each segment. Write the number for the expression in the space provided.

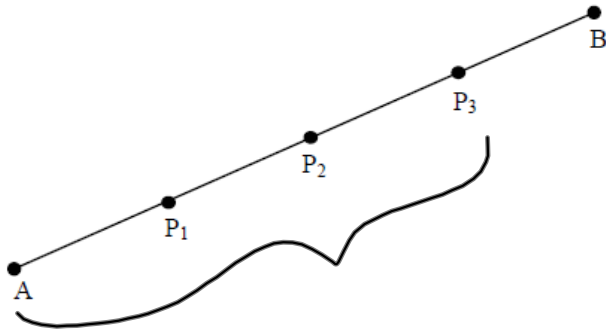
a) \overline{AB} 1

~~b)~~ \overline{AC} 5

~~c)~~ \overline{BC} 4

Question 7

Points P_1 , P_2 and P_3 divide segment \overline{AB} into four equal parts.



Determine the point that corresponds to each statement below:

- a) Divides $\overline{AP_3}$ in a ratio of $\frac{1}{2}$ _____ P_2
- b) Divides \overline{AB} in a ratio of $\frac{1}{1}$ _____ P_2
- c) Is located $\frac{1}{3}$ of the way along $\overline{AP_3}$ _____ P_1
- d) Is located $\frac{1}{4}$ of the way along \overline{AB} _____ P_1
- e) Is the mid-point of segment $\overline{AP_2}$ _____ P_1

Question 8

Calculate the coordinates of the point that divides segment \overline{CD} in a ratio of $\frac{3}{4} = \frac{a}{b}$.

The coordinates of point C are (9, 3) and those of point D are (-4, -6). Show all steps to your solution.

$$P\left(\frac{bx_1 + ax_2}{b+a}, \frac{by_1 + ay_2}{b+a}\right)$$

$$P\left(\frac{4(9) + 3(-4)}{4+3}, \frac{4(3) + 3(-6)}{4+3}\right)$$

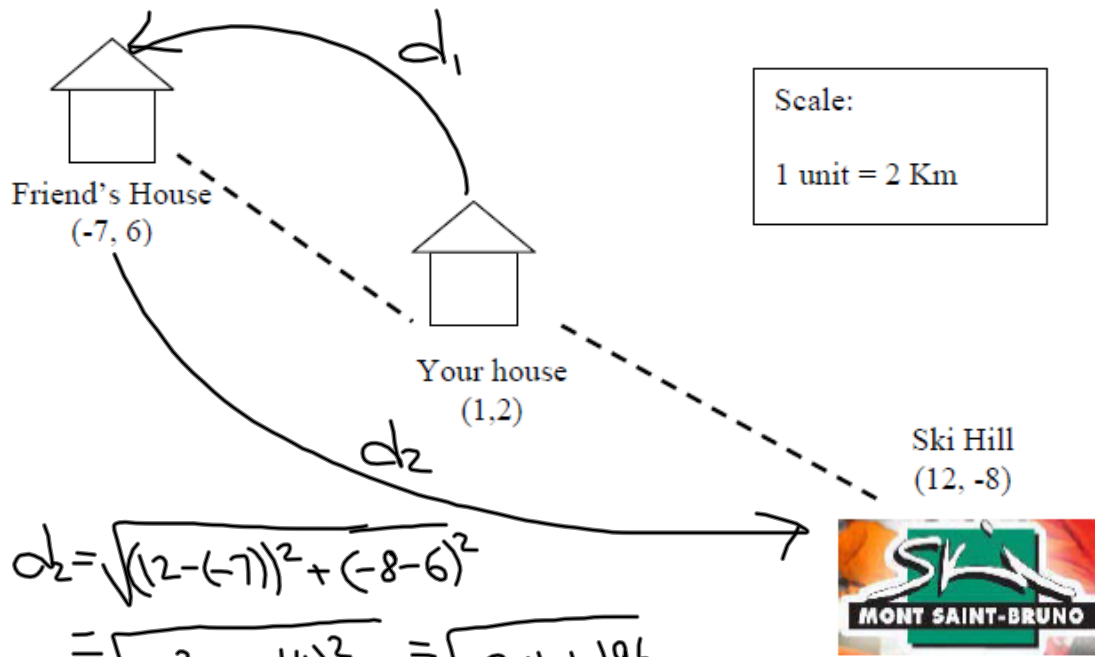
$$P\left(\frac{36-12}{7}, \frac{12-18}{7}\right)$$

$$P\left(\frac{24}{7}, \frac{-6}{7}\right)$$

Question 9

You and a friend decide to go snowboarding at Mount St-Bruno. Since you are the only one with a car, you decide to be nice and go pick your friend up at home, then drive over to the mountain.

You look on a map to figure out how far you will be driving to get there. How many kilometers will you be driving to get your friend and arrive at the mountain?



$$\begin{aligned}
 d_1 &= \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \\
 &= \sqrt{(1 - (-7))^2 + (2 - 6)^2} \\
 &= \sqrt{8^2 + (-4)^2} \\
 &= \sqrt{64 + 16} = \sqrt{80} = 8.9 \\
 d_1 &= 8.9 \text{ units}
 \end{aligned}$$

$$\begin{aligned}
 d_2 &= \sqrt{(12 - (-7))^2 + (-8 - 6)^2} \\
 &= \sqrt{19^2 + (-14)^2} = \sqrt{361 + 196} \\
 &= \sqrt{557} = 23.6
 \end{aligned}$$

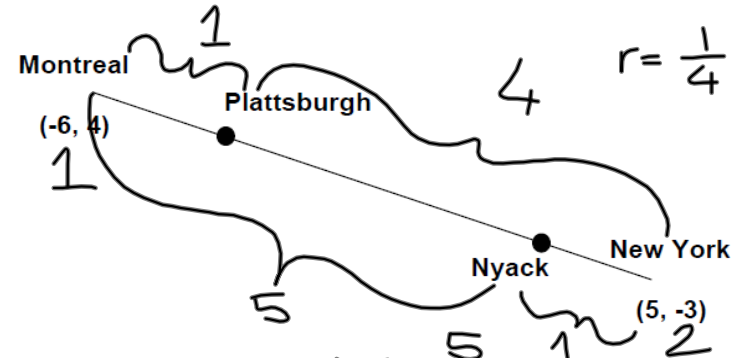
$$\begin{aligned}
 d_{\text{Tot}} &= d_1 + d_2 \\
 &= 8.9 + 23.6 = 32.5 \\
 &\quad \times 2 \\
 &\quad \hline
 &65 \text{ km}
 \end{aligned}$$

Question 10

During a trip to New York City, you need to stop twice for gas. Your first stop is in Plattsburgh, which happens to be $\frac{1}{5}$ of the way. The second stop is in Nyack, which is $\frac{5}{6}$ of the way.

One unit corresponds to 50 Km. Determine the distance between the two stops by identifying their coordinates and using the distance formula.

Clearly show your work.



$$P\left(\frac{bx_1 + ax_2}{b+a}, \frac{by_1 + ay_2}{b+a}\right)$$

$$P\left(\frac{4(-6) + 1(5)}{4+1}, \frac{4(4) + 1(-3)}{4+1}\right)$$

$$P\left(\frac{-24+5}{5}, \frac{16-3}{5}\right)$$

$$P\left(\frac{-19}{5}, \frac{13}{5}\right)$$

$$P(-3.8, 2.6)$$

$$N\left(\frac{1(-6) + 5(5)}{1+5}, \frac{1(4) + 5(-3)}{1+5}\right) = \frac{5}{1}$$

$$N\left(\frac{-6+25}{6}, \frac{4-15}{6}\right) \rightarrow N\left(\frac{19}{6}, \frac{-11}{6}\right)$$

$$N(3.16, -1.83)$$

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

$$= \sqrt{(3.16 - (-3.8))^2 + (-1.83 - 2.6)^2}$$

$$= \sqrt{6.96^2 + (-4.43)^2} = \sqrt{68.06} = 8.25 \text{ units}$$

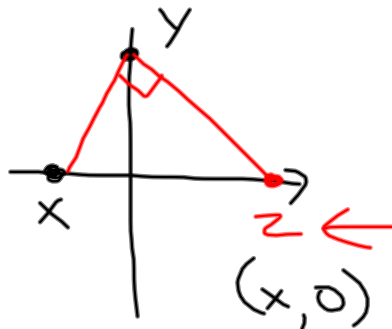
$$\frac{8.25 \times 50}{412.5 \text{ km}}$$

Question 11

In right-isosceles triangle XYZ, angle Y is a right angle.

The co-ordinates of X are (-5, 0) and the co-ordinates of Y are (0, 8), what is the length of the base XZ given that point Z is located on the x-axis.

Clearly show all steps to your solution.



Slope of \overline{XY} :

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{0 - (-5)}{8 - 0} = \frac{5}{8}$$

Slope of \overline{YZ} :

$$m_2 = -\frac{1}{m_1} = -\frac{1}{\frac{5}{8}} = -\frac{8}{5}$$

$Y(0, 8) \rightarrow$ y-int $b = 8$

Equation of $y = mx + b$

\overline{YZ} : $y = -\frac{8}{5}x + 8$

$Z(5, 0)$
 $X(-5, 0)$

$d_{XZ} = 5 - (-5) = 10$

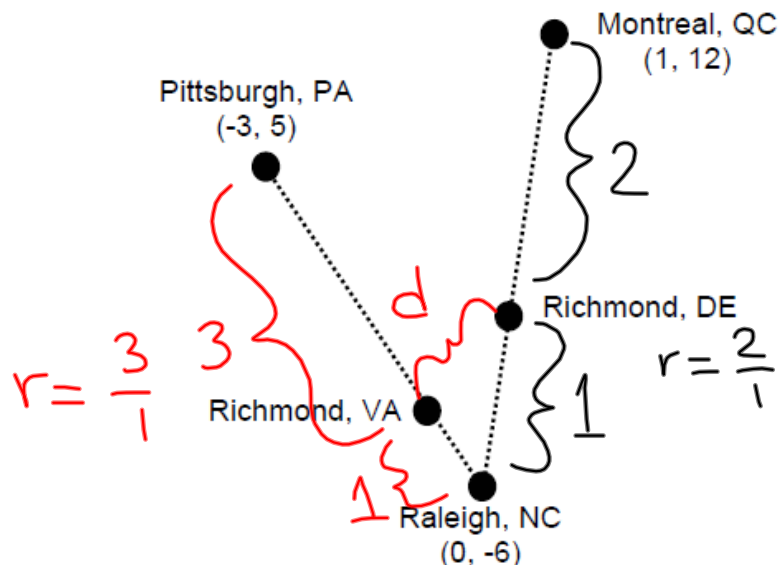
Find x-intercept; $0 = -\frac{8}{5}x + 8$

$$\frac{-8}{\frac{5}{-8}} = \frac{8}{\frac{5}{-8}}x \rightarrow x = 5$$

$Z(5, 0)$

Question 12

You are planning to meet some friends in Raleigh, NC for BBQ. You are leaving from Montreal, and your friends are leaving from Pittsburgh, PA.



After driving for 8 hours, you decide to stop for the night in Richmond, DE, approximately 2/3 the way to Raleigh. Your friends hit terrible traffic in Richmond, VA and are forced to spend the night there, approximately 3/4 the distance to Raleigh.

How far apart are you and your friends when you make your stops in Richmond, DE and Richmond, VA if one unit on the map represents 75km?

They are 256.5 km apart.

$$V\left(\frac{bx_1+ax_2}{b+a}, \frac{by_1+ay_2}{b+a}\right)$$

$$V\left(\frac{1(-3)+3(0)}{1+3}, \frac{1(5)+3(-6)}{1+3}\right)$$

$$V\left(\frac{-3}{4}, \frac{5-18}{4}\right)$$

$$V(-0.75, -3.25)$$

$$D\left(\frac{1(1)+2(0)}{1+2}, \frac{1(12)+2(-6)}{1+2}\right)$$

$$D\left(\frac{1}{3}, \frac{12-12}{3}\right)$$

$$D(0.33, 0)$$

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

$$= \sqrt{(0.33 - (-0.75))^2 + (0 - (-3.25))^2}$$

$$= \sqrt{1.08^2 + 3.25^2} = \sqrt{11.72}$$

$$= 3.42 \text{ units}$$

$$\frac{\times 75}{256.5 \text{ km}}$$