

Problem 1. Find the slope and y -intercept of the line $2y + 3x - 6 = 0$. (4 points.)

Solution. $2y + 3x - 6 = 0 \iff 2y = -3x + 6 \iff y = -\frac{3}{2}x + 3$. The slope is $-\frac{3}{2}$. The y -intercept is $(0, 3)$.

Problem 2. Find an equation of the line which is the perpendicular bisector of the line segment that joins the points $A(1, 4)$ and $B(7, 2)$. Give your final answer in slope-intercept form. (6 points.)

Solution. Step 1. We find the midpoint of A and B . The coordinates are given by:

$$M = \left(\frac{1+7}{2}, \frac{4+2}{2} \right) = (4, 3).$$

Step 2. We find the slope of the line through A and B . The slope is given by:

$$S_{AB} = \frac{2-4}{7-1} = \frac{-2}{6} = -\frac{1}{3}.$$

Step 3. We find the slope of the desired line. If we let S_M be the slope, then the perpendicularity of the lines implies $S_{AB} \cdot S_M = -1$. Thus,

$$S_M = \frac{-1}{-1/3} = 3.$$

Step 4. We find the equation of the desired line. It is clear that the equation is of the form

$$y = 3x + b.$$

Since the line passes through $M(4, 3)$, we have

$$3 = 3(4) + b \iff 3 = 12 + b \iff b = -9.$$

It follows that the equation of the line is

$$y = 3x - 9.$$