

**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

$$y = 3x - 9.$$