

## Third set of Homework

Nikos Apostolakis

**Please note:** You should fully justify your answers.

### 1 Review of lines and their equations

- Find the slope intercept form of a line that:
  - has slope 3 and passes through the point  $(0, -5)$ .
  - has slope  $-2$  and passes through the point  $(1, 5)$ .
  - contains the points  $(-1, 3)$  and  $(2, 4)$ .
  - is parallel to the line with equation  $2x - 3y = 7$  and contains  $(0, 0)$ .
  - is perpendicular to the line with equation  $y = \frac{3}{2}x + 1$  and contains the point  $(3, 4)$ .
- Find an equation in standard form of the line that:
  - is parallel to the line  $2x - 3y = 5$  and passes through  $(-1, -3)$ .
  - is perpendicular to the line  $3x + 4y = 2$  and passes through  $(2, -3)$ .
- Find the point of intersection of the following two lines:
  - $y = 3x - 1$  and  $y = 2x + 5$ .
  - $y = -3x - 4$  and  $2x + 3y = 7$ .
  - $2x + 3y = 5$  and  $3x - 2y = 1$ .
- Find the coordinates of the point where the line from  $A(0, 3)$  and perpendicular to  $l : 3x - 5y = 9$  meets  $l$ .
- Verify that the three lines:  $l_1 : x + 3y = 11$ ,  $l_2 : -2x + 3y = 5$  and  $l_3 : y = 5x - 7$  pass through the same point.
- Verify that the following four points are the corners of a parallelogram.
$$P(-4, -9), Q(-2, -3), R(-4, -7), S(-6, -13)$$
- Verify that the following three points are the corners of a right triangle.
$$A(2, 4), B(0, 0), C(4, 3)$$
- Verify that the following four points are the corners of a rectangle.
$$A(1, 1), B(4, 4), C(-1, 3), D(2, 6)$$
- A *median* of a triangle is a segment that connects one of the vertices of the triangle with the midpoint of the opposite side. Thus a triangle has three medians. It is a fact that *in any triangle all three medians have a common point*. Verify that this is the case for the triangle with vertices at the points  $A(0, 0)$ ,  $B(4, 0)$ ,  $C(1, 3)$ .
- For the right triangle of Question 7 verify that the median to the hypotenuse is half the length of the hypotenuse.