



# Intermediate Math Circles

## Analytic Geometry I

Problems March 23, 2011

### Problem (1)

Three points are *collinear* if they all lie on a straight line. Show that  $P(-12, 1)$ ,  $Q(-4, -3)$  and  $R(6, -8)$  are collinear.

- Use a slope argument to show collinearity.
- Use a distance argument to show collinearity.

### Problem (2)

The point  $A(-2, y)$  is on a line that passes through the points  $T(0, -2)$  and  $W(4, 0)$ . Determine the value of  $y$ .

### Problem (3)

$\triangle ABC$  has vertex  $A$  on the  $x$ -axis at  $-2$  and vertex  $C$  on the  $x$ -axis at  $8$ . The third vertex  $B$  is on the  $y$ -axis at  $b$  such that  $\angle ABC = 90^\circ$ . Determine all possible values of  $b$ .

### Problem (4)

A point  $W$  is located on the  $x$ -axis so that it is 13 units from the point  $R(7, 5)$ . Find the coordinates of point  $W$ .

### Problem (5)

The points  $A$  and  $B$  are located in the first quadrant, equidistant from the origin,  $O$ . If the slope of  $OA$  is 7 and the slope of  $OB$  is 1, determine the slope of  $AB$ .

### Problem (6)

The vertices of  $\triangle ABC$  are  $A(-2, -11)$ ,  $B(10, 5)$  and  $C(12, 3)$ .

- Determine the midpoint  $M$  of line segment  $AB$ .
- Show that  $AM = MB = MC$ . This will prove that  $M$  is the centre of a circle containing points  $A, B$  and  $C$  on the circumference.
- Show that  $\angle ACB = 90^\circ$ .

### Problem (7)

The line segment  $AB$ , where  $A$  is  $(2, -4)$  and  $B$  is  $(10, 8)$ , is divided at  $Q$  in the ratio  $3 : 5$ . Find the coordinates of  $Q$ .

