

# MA10103: Foundation Mathematics I

## PROBLEM SHEET 5

You can also get help from MASH, the *Mathematics And Statistics Help* at the University of Bath. See their website at [www.bath.ac.uk/study/mash/](http://www.bath.ac.uk/study/mash/) for its location and opening times.

The office hour has changed. It is now Tuesdays from 14.15 to 15.05!

Please, do all questions and hand in solutions to the starred questions at the lecture on *Monday 5th November*.

1. Solve the following equations:

$$x^2 + x - 6 = 0; \quad 2x^2 + 1 = -3x; \quad 6x^2 = 7x + 3;$$
$$-4x^2 + 12x - 9 = 0; \quad x^2 - 3x - 3 = 0.$$

2. State the condition under which the equation  $x^2 + bx + c = 0$  has exactly one solution.  
For what values of  $b$  does the equation  $2x^2 + bx = -9$  have exactly one solution?  
And for what values of  $b$  two solutions?
3. Find a value of  $c$  for which the equation  $x^2 + 5x + c = 0$  has no real solutions.

- 4\*. (a) Solve the following two quadratic equations:

$$x^2 + 3x + 1 = 0; \quad x^2 - x - 6 = 0.$$

- (b) Solve the following equations:

$$4^x + 3 \times 2^x + 1 = 0; \quad 9^x - 3^x - 6 = 0.$$

- (c) Solve the following equations:

$$x^4 + 3x^2 + 1 = 0; \quad x^4 - x^2 - 6 = 0.$$

*Please turn over!*

5\*. Solve the following sets of simultaneous equations, finding  $x$  and  $y$  in each case:

(a)  $x - 2y = -7$  and  $-2x + 3y = 9$ .

(b)  $3x + 2y = -6$  and  $x + y = 1$ .

(c)  $xy = 1$  and  $x + y - 3 = 0$ .

(d)  $x + y = 2$  and  $y^2 - x^2 = 8$ .

(e)  $2x - y = 2$  and  $x^2 - y = 5$ .

6. Solve the pair of equations:

$$\log_2 x + 3y = 5 \quad \text{and} \quad (\log_2 x)^2 + y(y - 1) = 3.$$

7\*. For what values, in radians, of  $\theta$  (between 0 and  $2\pi$ ) is  $\sin \theta = 1$ ?  
For what values, in radians, of  $\theta$  (between 0 and  $2\pi$ ) is  $\cos \theta = -1$ ?  
For what values, in radians, of  $\theta$  (between 0 and  $4\pi$ ) is  $\sin \theta = 1/2$ ?  
For what values, in radians, of  $\theta$  (between 0 and  $4\pi$ ) is  $\tan \theta = 1$ ?

8. (a) Give the following angles in radians:

$$20^\circ; \quad 70^\circ; \quad 105^\circ; \quad 288^\circ; \quad 348^\circ.$$

(b) Give the following angles in degree:

$$\frac{1}{3}\pi; \quad \frac{6}{5}\pi; \quad \frac{15}{4}\pi; \quad \frac{7}{8}\pi; \quad \frac{5}{3}\pi.$$

(c) Calculate the following values (to four decimal places):

$$\sin 22^\circ; \quad \cos \left( \frac{3}{7}\pi \right); \quad \sin 108^\circ; \quad \sin \left( \frac{2\pi}{9} \right); \quad \tan \left( \frac{2}{5}\pi \right).$$