

## ENGR122 Assignment 1

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1. Solve and factorise the following quadratic equations:

(a)  $x^2 + 4x - 21 = 0$

(b)  $x^2 = 1$

(c)  $2z^2 - z - 1 = 0$

(d)  $4s^2 - 2 = s$

(e)  $x^2 + 1 = 0$

(f)  $-x^2 - 3x - 4 = 0$

2. Calculate the roots of the equation

$$3x^3 - 11x^2 + 16x - 12 = 0,$$

given  $x = 2$  is a root.

3. Solve the quadratic inequality

$$x^2 + 2x - 8 \leq 0$$

4. Write down the complex conjugates of the following complex numbers:

(a)  $-11 - 8i$

(b)  $5 + 3i$

(c)  $2i$

5. If  $z_1 = 3 + 2i$  and  $z_2 = 4 - 8i$  find

(a)  $z_1 + z_2$

(b)  $z_1 - z_2$

(c)  $z_2 - z_1$

(d)  $z_1 z_2$

(e)  $z_1/z_2$

6. Express the following in the form  $a + bi$

(a)  $\frac{5+3i}{2+2i}$

(b)  $\frac{-2+3i}{i}$

(c)  $(5 + 3i)(2 - i) - (3 + i)$

(d)  $(1 - 2i)^2$

(e)  $\frac{5-8i}{3-4i}$

(f)  $\frac{3}{3+2i} + \frac{1}{5-i}$

7. Plot the following complex numbers on an Argand diagram:

(a)  $z_1 = -3 - 3i$

(b)  $z_2 = 7 + 2i$

(c)  $z_3 = 3$

(d)  $z_4 = 3i$

8. Find the values of the real numbers  $x$  and  $y$  which satisfy the equation:

$$\frac{2 + x - y i}{3x + y i} = 1 + 2i$$

9. Find  $z = z_1 + z_2 z_3 / (z_2 + z_3)$  when  $z_1 = 2 + 3i$ ,  $z_2 = 3 + 4i$  and  $z_3 = -5 + 12i$ .

10. Find  $z_3$  in the form  $x + yi$ , where  $x$  and  $y$  are real numbers, given that

$$\frac{1}{z_3} = \frac{1}{z_1} + \frac{1}{z_1 z_2}$$

where  $z_1 = 3 - 4i$  and  $z_2 = 5 + 2i$ .

The marks are 12,8,10,6,10,12,8,10,12,12 for questions 1-10. Total is 100.