

1 October, 2012
MATH 1104, Section E

TEST 1

1. Consider $z = -2 - 3i$

- (a) What is the **complex conjugate** of z [2 marks]?
- (b) Evaluate $|z|$ [2 marks].

2. Simplify the following into the form $a + bi$ [6 marks]:

$$\frac{3 - 2i}{2 + i} - \frac{1 + i}{1 - i}$$

3. Find the complex roots of the polynomial $x^2 + 4x + 5 = 0$ [3 marks].

4. Solve for the **complex value**, x [5 marks]:

$$ix - (2 + i)^2 = 2 + i$$

5. Consider the following 3 vectors:

$$\vec{x} = \begin{pmatrix} 1 \\ 0 \\ 1 \end{pmatrix}, \vec{y} = \begin{pmatrix} 1 \\ 1 \\ 2 \end{pmatrix}, \vec{z} = \begin{pmatrix} -2 \\ 0 \\ 1 \end{pmatrix}$$

- (a) Determine the **cosine** of the angle between \vec{x} and \vec{y} [4 marks].
 - (b) Find the angle between \vec{y} and \vec{z} . Give your answer in **degrees OR radians** [3 marks].
 - (c) State the property which indicates 2 vectors are orthogonal [2 marks].
 - (d) Evaluate $\vec{x} - \vec{y}$ [2 marks].
 - (e) Evaluate $|3\vec{x} + 2\vec{y} + \vec{z}|$ [6 marks].
 - (f) Find the projection of \vec{x} onto \vec{y} [5 marks].
 - (g) Normalize \vec{x} [2 marks].
 - (h) Find the unit vector that points in the **opposite** direction of \vec{z} [2 marks].
6. Show that the following vectors are parallel using **3 DIFFERENT METHODS** [6 marks, 4 BONUS marks].

$$\vec{u} = \begin{pmatrix} 1 \\ -1 \\ 1 \end{pmatrix}, \vec{v} = \begin{pmatrix} -4 \\ 4 \\ -4 \end{pmatrix}$$