



# MATHEMATICS SPECIALIST 3CD

**SEMESTER 1 2010**

## TEST 2

	Questions	Reading Time	Working Time	Marks
<b>Calculator Free</b>	<b>1 – 4</b>	<b>5 minutes</b>	<b>15 minutes</b>	<b>12</b>
Calculator Assumed	5 - 8	5 minutes	30 minutes	24
Total				36

**1.** [1, 2 marks]

Express in exact rectangular form:

(a)  $e^{i\frac{\pi}{6}}$

(b)  $3e^{2+i\frac{2\pi}{3}}$

**2.** [2 marks]

Given that  $z = 3e^{i\theta}$ , determine an expression in exponential form for  $iz$ .

**3.** [2, 1, 1 marks]

Given that  $w = \sqrt{3} + i$ , express in exact exponential form:

(a)  $w$

(b)  $\bar{w}$

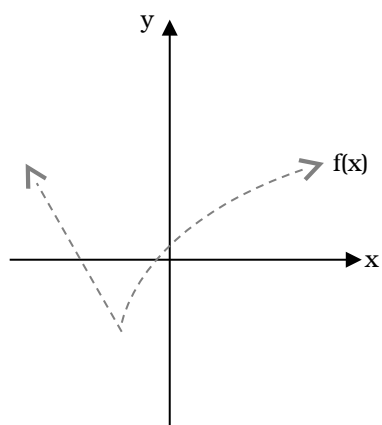
(c)  $w^3$

4. [1, 2 marks]

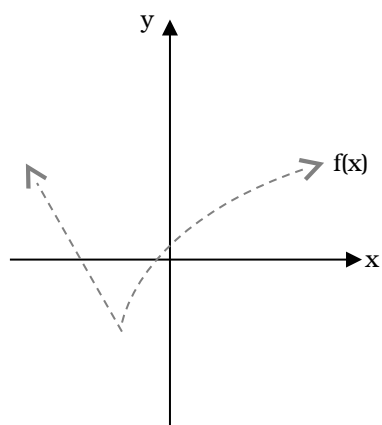
The sketch of  $y = f(x)$  is given below.

Sketch on the same axes the graphs of:

(a)  $y = f(|x|)$



(b)  $|y| = f(x)$





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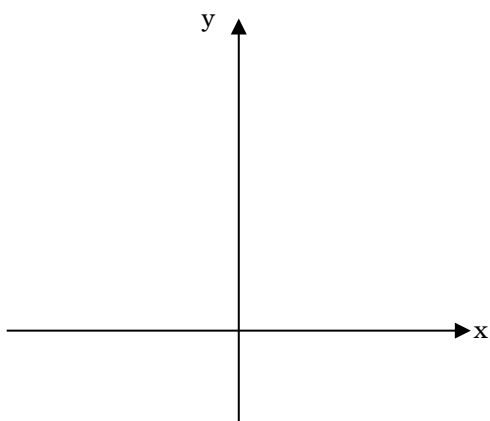
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**5.** [2 marks]

Solve for x:  $\sqrt[3]{3+|x|} \leq 2$

**6.** [1, 1, 2 marks]

(a) Sketch the graph of  $f(x) = |x^2 - 2x - 2|$ .



Hence state the value(s) of b such that  $f(x) = b$  has exactly

(a) three solutions

(b) two solutions

Change this to  
 $3 + 2\mu - 2\lambda$

7. [1, 4, 5 marks]

Consider the plane  $\Pi_1$ :  $\mathbf{r} = (3 + 2\mu - \lambda)\mathbf{i} + (5 - 4\mu + 2\lambda)\mathbf{j} + (7 + 3\mu + 3\lambda)\mathbf{k}$ .

(a) Find the equation of the plane containing the point (2, 1, 5) and parallel to  $\Pi_1$ .

(b) Determine if the point (13, -9, 4) lies on the plane  $\Pi_1$ .

(c) Write  $\Pi_1$  in normal form (ie  $\mathbf{r} \cdot \mathbf{n} = c$ ).

**8.** [8 marks]

A sphere centred at (3, 4, -2) and with radius 2 can be defined by the vector equation  $|\mathbf{r} - (3\mathbf{i} + 4\mathbf{j} - 2\mathbf{k})| = 2$ . Determine the minimum distance the sphere is from the plane defined by  $x - y + 2z = 13$ .