

**Hale School**

**MATHEMATICS**

**SPECIALIST**

**3CD**

**Semester Two Examination 2010**

**QUESTIONS**

**Section One**

**Calculator-Free**

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**Question 1 [6 marks]**

Find the anti-derivative :

(a) 

[2 marks]

(b) 

[2 marks]

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[2 marks]

**Question 2 [9 marks]**

Given that z = 2eix and w = 2e–ix :

(a) express iz in complex exponential form.

[2 marks]

(b) express  in complex exponential form.

[2 marks]

© simplify z2 + w2

[2 marks]

(d) solve for x given that z3 + 8 = 0

[3 marks]

**Question 3 [4 marks]**

Points A and B have respective position vectors given by :

**a** = 2**i** + **j**  - **k**

**b** = x**i** + **j**  + **k**

Determine the value of x given that vectors **a**  and **b** are at an angle of 60o.

**Question 4 [4 marks]**

Give the following transformation matrices, describe their effect on some object in the co-ordinate plane :

(a) 

[1 mark]

(b) 

[1 mark]

**Question 4 [4 marks]**

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[2 marks]

**Question 5 [6 marks]**

Prove using the method of mathematical induction that, for all values of the positive integer n, 7n + 2 is always divisible by 3.

**Question 6 [7 marks]**

A particle’s position is given by x(t) cm after t seconds and moves according to the differential equation :



It is known that x(0) = k cm, and its velocity v(0) =  cm s-1 where k is some positive constant. Write an expression (in terms of the constant k) for :

1. the displacement x(t).

[5 marks]

(b) the distance travelled in the first 4 seconds.

[2 marks]

**Question 7 [4 marks]**

It is known that  is a solution to the equation zn = i. Determine the set of possible values for the positive integer n.