



PERTH COLLEGE  
YR 12 3CD SPECIALIST MATHEMATICS  
SEMESTER ONE 2010  
TEST 1

VECTORS (70%) DIFFERENTIATION (30% - functions 22%, trig 8%)  
Simple (~70%) Complex (~30%)

Name: \_\_\_\_\_

Time Allowed: 60 minutes / 50 = %

|             |     |
|-------------|-----|
| SECTION ONE | /20 |
| SECTION TWO | /30 |

SECTION ONE: CALCULATOR FREE

TIME: 25 minutes

TOTAL MARKS: 20

- Answer all questions neatly in the spaces provided.
- **Show all working** where appropriate.
- **One side** of an A4 sheet of paper for notes is allowed for Section 2 only.
- Formula sheet may be used for both sections.

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Question 1 (2, 1, 2 = 5 marks)

Given  $m = 4i + 6j + k$ ,  $p = 2i - 3j$  and  $n = 8i + 4j + 2k$

a) Find  $2p - 4n$

b) Find  $|m|$

c) Find  $n \cdot p$

**Question 2 (1, 1, 1, 2, 1, 1 = 7 marks)**

Three points in space are given:

$$P(2, 2, 0) \quad Q(1, 1, 1) \quad R(2, -1, 2)$$

Find:

a)  $\overrightarrow{PQ}$

b)  $|\overrightarrow{PQ}|$

c) The parametric equations of the line through P and Q.

d) The Vector equation of the plane through P, Q, and R in the form:

(i)  $ax + by + cz = d$       given  $d = 6$

(ii)  $r \cdot n = c$

(iii)  $r = a + \lambda b + \mu c$

**Question 3 (2, 1 = 3 marks)**

- a) Two points in space are given;

$$P(6, -2, 2) \wedge Q(0, 4, -2)$$

Find the coordinates of M which divides QP in the ratio 2:5

- b) Find a unit vector parallel to  $\begin{pmatrix} -8 \\ 0 \\ 6 \end{pmatrix}$ .

**Question 4 (1, 1, 1, 2 = 5 marks)**

Given the following functions find  $\frac{dy}{dx}$ :

a)  $y = x^4(3x + 4x^3 + 2)$

b)  $y = 2\cos t$

c)  $y = \sin u \wedge u = x^2 - 3x$

d)  $y = \frac{\sqrt{x} + 4}{\sqrt{x} - 4}$  *(Answer in positive indices)*