



Name: _____

Teacher: _____

Class: _____

FORT STREET HIGH SCHOOL

2008

HIGHER SCHOOL CERTIFICATE COURSE

ASSESSMENT TASK 4: TRIAL HSC

Mathematics Extension 1

TIME ALLOWED: 2 HOURS

(PLUS 5 MINUTES READING TIME)

Outcomes Assessed	Questions	Marks
Chooses and applies appropriate mathematical techniques in order to solve problems effectively	1, 2	
Manipulates algebraic expressions to solve problems from topic areas such as inverse functions, trigonometry and polynomials	3, 4, 5	
Uses a variety of methods from calculus to investigate mathematical models of real life situations, such as projectiles, kinematics and growth and decay	6	
Synthesises mathematical solutions to harder problems and communicates them in appropriate form	7	

Question	1	2	3	4	5	6	7	Total	%
Marks	/12	12	/12	12	12	/12	/12	/84	

Directions to candidates:

- Attempt all questions
- The marks allocated for each question are indicated
- All necessary working should be shown in every question. Marks may be deducted for careless or badly arranged work.
- Board – approved calculators may be used

Total marks – 84

Attempt Questions 1 – 7

All questions are of equal value

Answer each question in a SEPARATE writing booklet. Extra writing booklets are available.

Question 1. (12 marks) Use a SEPARATE writing booklet.

Marks

(a) Evaluate $\lim_{x \rightarrow 0} \frac{\sin 2x}{3x}$

1

(b) Let A be the point $(8, 10)$ and B the point $(-2, 4)$.

2

Find the coordinates of the point P which divides the interval AB externally in the ratio 2:5.

(c) Solve $\frac{1}{x+2} \leq 2$

3

(d) The angle between the line $y = 2x$ and the tangent to the curve $y = Ax^2 + Ax$ at $x = 1$ is $\frac{\pi}{4}$ radians. Find the values of A .

3

(e) Use the substitution $u = 2x + 1$ to evaluate $\int_{-\frac{1}{2}}^{\frac{1}{2}} x\sqrt{2x+1} \, dx$.

3

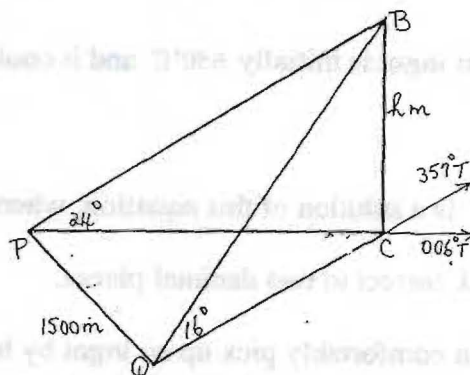
(a) Find $\int_0^{\frac{\pi}{4}} 2\cos^2 x \, dx$

2

(b) Two observers P and Q are 1500 metres apart.

The bearing of a balloon B from observer P is 006° T while the angle of elevation from P is 24° .

The bearing of balloon B from observer Q is 357° T while the angle of elevation from Q is 16° .



(i) Show that if the height BC is h metres then

3

$$h = \frac{1500}{\sqrt{\cot^2 24^\circ + \cot^2 16^\circ - 2 \cot 24^\circ \cot 16^\circ \cos 9^\circ}}$$

(ii) Hence find h to the nearest metre.

1

(c) $P(x) = x^3 + 3x^2 + x - 5$.

(i) Show that $x-1$ is a factor of $P(x)$

1

(ii) Hence factorise $P(x)$

2

(d) A spherical ball is expanding so that its volume is increasing at the constant rate of 10 mm^3 per second.



What is the rate of increase of the radius when the surface area is 400 mm^2 ?

3