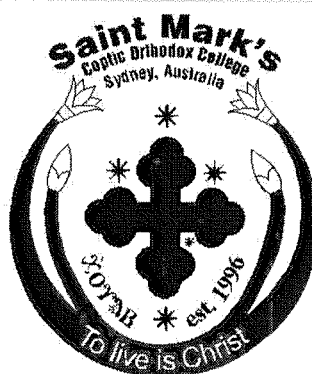


Name: _____

Teacher: _____

ST MARK'S COPTIC ORTHODOX COLLEGE

Mathematics Department



2010

Year 11 Extension 1

Semester One Examinations

Examiner: Mr. Wagdy. Micheal

GENERAL INSTRUCTION

- Reading time 5 minutes
- Working Time – 2 hours
- Write in black or blue pen only
- Approved calculators may be used

- All necessary working must be shown
- Begin each question on a different booklet
- Attempt all questions

Question 1 (13 marks) *Start work on a new page*

Mark

a) $2m^3 - 128$

2

b) Solve for x : $\frac{x}{x-2} \geq 2$

3

c) Solve for x and y : $x^2 + y^2 - 2y - 4 = 0$ and $x - y + 2 = 0$

2

d) Solve for x : $\cos 2x = \cos x$, $0^\circ \leq x \leq 360^\circ$

3

e) Find the exact value of $\frac{\cos^2 15^\circ - \sin^2 15^\circ}{\sin 15^\circ \cos 15^\circ}$

3

Question 2 (13 marks) *Start work on a new page*

a) i. Sketch these functions on the same set of axes
 $y = |x - 3|$ and $y = |3x + 2|$

3

ii. Determine the number of solutions to the equation $|x - 3| = |3x + 2|$

1

iii. Hence, or otherwise solve the equation in part (ii)

2

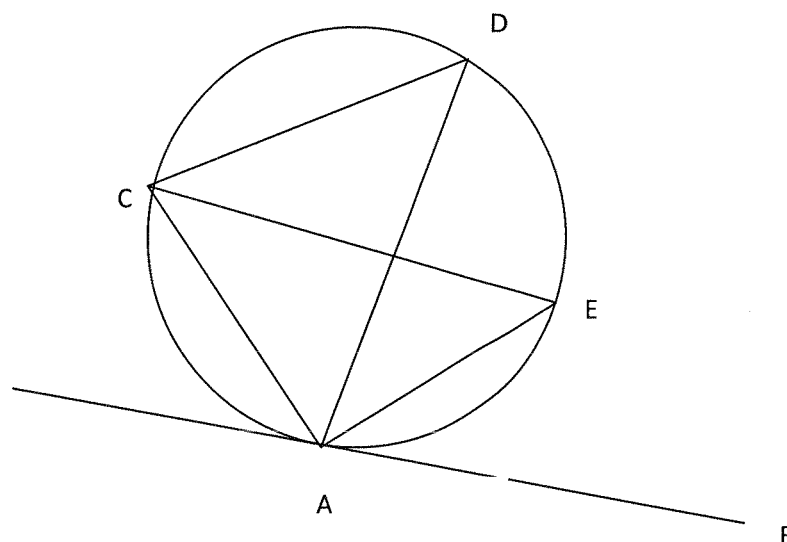
iv. Use your sketch to solve $|x - 3| < |3x + 2|$

1

	Marks
b) Let $f(x) = \frac{x}{x^2-1}$,	1
i. For what values of x is $f(x)$ undefined?	1
ii. Show that $y = f(x)$ is an odd function.	1
iii. Find the horizontal asymptote.	1
iv. Hence sketch the curve, showing all essential features	3

Question 3 (13 marks) *Start work on a new page*

a)



AB is a tangent and CE is a diameter to a circle centre O. Angle BAE equals 48 degrees

and D lies on the circumference as shown in the diagram.

- | | | |
|-----|--|---|
| i. | Copy the diagram and find the size of angle ACE, giving reasons. | 1 |
| ii. | Find the size of angle ADC. Justify your answer. | 2 |

Marks

b) Find the exact value $\frac{\tan 85^\circ - \tan 25^\circ}{1 + \tan 85^\circ \tan 25^\circ}$

1

c) i. Write down the values of θ for which $\frac{1}{1 + \sin \theta}$ is undefined

1

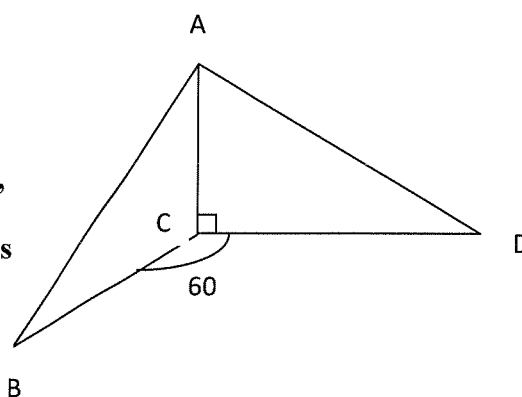
iii. Show that $\frac{1}{1 + \sin \theta} = \sec^2 \theta - \sec \theta \tan \theta$

2

d) If $\cos \theta = \frac{2}{3}$ and θ is acute angle, find the exact values of $\tan \frac{\theta}{2}$.

3

- e) Two boats B and D, subtend an angle of 60° at the base of a cliff. From boat B, The angle of elevation of A, 100 metres Vertically above C, is 20° boat D is 600 metres from C.



- i. Calculate the length of BC, correct to one decimal place.

1

- ii. Calculate the distance between the two boats, correct to the nearest metre.

2

Question 4 (13 marks) Start work on a new page

a) i) Express $\sqrt{3} \cos x - \sin x$ in the form $R \cos (x + \alpha)$, $R > 0$ and $0^\circ < \alpha < 360^\circ$.

2

ii) Solve $2\sqrt{3} \cos x - 2 \sin x - 2 = 0$, for $0^\circ \leq x \leq 360^\circ$

2

b) i) prove that $\cos 2\beta = 1 - 2\sin^2 \beta$

1

ii) Find the exact value of $\sin 15^\circ$

2

c) Show that $\frac{\cos B - \cos (B+2A)}{2 \sin A} = \sin (B + A)$

2

d) The elevation of a wireless mast PQ from a point X due south of it is observed

4

to be $70^\circ 12'$, while from a point Y, due east of X, the elevation is $58^\circ 12'$,

given $XY = 100$ m. Draw a clear diagram of the information given then find the height

“h” of the mast PQ.

Question 5 (13 marks) Start work on a new page

a) Use the “t” method to find the general solutions for $\sin x + \cos x = 1$

5

b) Solve the pair of simultaneous equations:

$$x + 2y - z = -5$$

$$2x - 3y + 4z = 28$$

$$4x + 5y - 3z = -10$$

4

c) i. Sketch $f(x) = \begin{cases} -5 & \text{for } x < -3 \\ 2x & \text{for } -3 < x < 0 \\ x^2 & \text{for } x \geq 0 \end{cases}$

3

iii. Find the domain of $f(x)$.

1

Question 6 (13 marks) *Start work on a new page*

Mark

a) Solve for $0^\circ \leq \theta \leq 360^\circ$, $\cos \theta + 3\sin \frac{\theta}{2} - 2 = 0$

5

b) Find the values of x for which the following inequalities are satisfied

3

simultaneously: $\frac{x+1}{x-3} \leq 1$ and $x^2 + 5x - 6 > 0$

c) AB and CD are chords of a circle. AB produced and CD produced meet at X .

i. Show that $\triangle XAC \sim \triangle XDB$.

3

ii. Deduce that $XA \cdot XB = XC \cdot XD$

2

END OF EXAM