SIR ARTHUR LEWIS COMMUNITY COLLEGE

DEPARTMENT OF TECHNICAL EDUCATION AND MANAGEMENT STUDIES

EXAMINATION SESSION	:	May 2014 - Final Examination
TUTOR (S)	:	F. Nathaniel, A. L-Goodman, P. Jn. Francois, A. D-Felix
COURSE TITLE	:	Trigonometry & Complex Nos.
COURSE CODE	:	MAT104
CLASS (ES)	:	Year One
DATE	:	Tuesday 13th May, 2014
COMMENCEMENT TIME	:	9:00 a.m.
DURATION	:	2 hours
INVIGILATOR (S)	:	**C. Alexander,** L. Philbert; F. Paul **P. JnFrancois,** K. Numa
ROOM (S)	:	CEH-0R-02 TRB-Lab

INSTRUCTIONS

1. Ensure your student ID number is clearly written on each answer sheet.

2. This paper consists of questions in two sections, **A**, and **B**. You are required to answer **ALL** questions from section **A**, and *THREE* (3) questions from section **B**.

3. Give **all non-exact** answers to **THREE** (3) significant figures, or **ONE** (1) decimal place in the case of angles in degrees.

4. The use of an electronic calculator is expected when appropriate.

5. Ensure that your solutions are clearly written.

6. *DO NOT* scribble on the question paper -- scrap paper will be provided.

7. A list of formulae is provided with the

Section A

Answer all questions. This section is worth 52 marks.

1. Solve the equation $10 \sin x = -3$ for $-180° \leq x \leq 180°$. [3]

2. Prove the identity $\frac{2 \sin A \cos A}{1-(2\cos^2 A - 1)} = \frac{1}{\tan A}$. [3]

3. Sketch the graph of the function $y = \cos x + 3$ for $0° \leq x \leq 360°$. [3]

4. Solve the equation $5x^2 + 8x + 5 = 0$ giving answer in the form $a \pm bi$. [4]

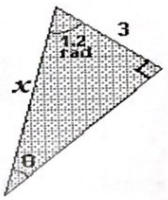
5. A man walking at 1.15 ms^{-1} pushes a lawn roller of diameter 20 cm, a distance of 12.55 m.

   a. What is the angular velocity of the lawn roller in rad/sec. [2]
   b. How many revolutions did the lawn roller make in covering the $12.55m$ distance? [2]

6. Find the real numbers p and q, given that $7 + 2q + 2pi = 3p + (12 + 5q)i$ [5]

7. Given the triangle shown in figure shown,

   a. Find the value of x
   b. Give the value of the angle θ in radians.



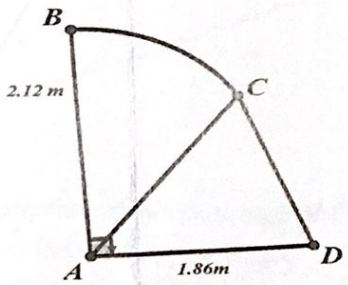
[4]

8.

   a. Given $z_1 = -3 + 2i$ and $z_2 = 4 - 5i$ find $z_1 + z_2$. [2]
   b. The complex number z_3 is given by $z_3 = \sqrt{8}\left(\cos\frac{\pi}{4} - i\sin\frac{\pi}{4}\right)$ and z_4 is the complex number $e^{i\frac{\pi}{2}}$, find $z_4 - z_3$ in rectangular form. [4]

9. The complex number z is given by $z = \frac{4-3i}{1-2i}$.

   a. Express z in the form $x + iy$, where x and y are real numbers. [4]
   b. Find the modulus and argument of z [4]



10. The figure above shows the cross section of $ABCD$ of a small shed. The straight line AB is vertical and has length 2.12 m. The straight line AD is horizontal and has length 1.86m. the curve BC is an arc of a circle with centre A and CD is a straight line. Given that the size of $< BAC$ is 0.65 radians, Find

a. The length of the arc BC in m, to 2 decimal places. [2]

b. The area of the sector BAC in m^2 to 2 decimal places [2]

c. The size of $< CAD$ in radians to 2 decimal places [2]

d. The area of the cross section $ABCD$ of the shed in m^2 to 2 decimal places [4]

Section B

Choose any **three** questions. Each question is worth 6 marks.

1. From the deck of a boat, the angle of elevation to the top of an offshore oil rig is found to be $31°30'$. The top of the oil rig is 127 m above the level of the platform on which it stands. Assume that the head of the person doing the sighting is level with the base of the oil rig. What is the distance between the base of the oil rig and the boat? [6]

2. Prove the identity

$$\frac{1+\sin x}{\cos x}+\frac{\cos x}{1+\sin x}\equiv\frac{2}{\cos x}$$

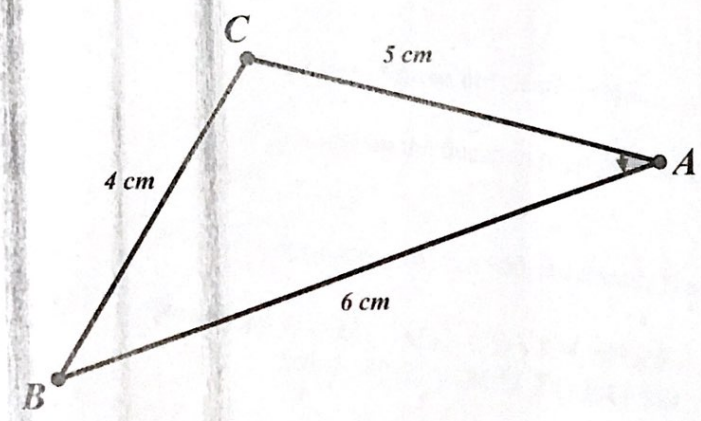
[6]

3. Using De Moivre's theorem or otherwise, find the two square roots of the complex number $5-12i$, giving your answer in the form $x+iy$, where x and y are real numbers. [6]

4. The bearing of a lighthouse sighted by the navigator of a ship was found to be $103°20'$. After the ship travelled 3.3 km on a course $13°20'$, the navigator found the bearing of the lighthouse to be $147°50'$. Find the distance between the ship and the lighthouse at the time of the second sighting. [6]

5. Find all the solutions in the interval $0 \le x < 2\pi$ of the equation $2\cos^2 x + 1 = 5\sin x$ giving each solution in terms of π [6]

6.



The figure above shows the triangle ABC with $AB = 6cm, BC = 4\ cm$ and $AC = 5\ cm$.

(a) Show that $\cos A = \frac{3}{4}$ [3]

(b) Hence or otherwise find the exact value of $\sin A$ [3]