

FACULTY OF SCIENCE



UNIVERSITY  
OF  
JOHANNESBURG

DEPARTMENT OF MATHEMATICS

**MODULE**      **MAT2T1B**  
                  MATHEMATICS FOR TEACHERS 2B

**CAMPUS**      **APK**

**EXAMINATION**    **DECEMBER 2014**

**DATE:**      03 DECEMBER 2014      **SESSION:** 08:00 – 10:00

**ASSESSOR:**      **MR. T. MOHUBEDU**

**INTERNAL MODERATOR:**      **MS. S. RICHARDSON**

**DURATION:**      **2 HOURS**      **MARKS:** 100

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**SURNAME AND INITIALS** \_\_\_\_\_

**STUDENT NUMBER** \_\_\_\_\_

**CONTACT NUMBER** \_\_\_\_\_

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**NUMBER OF PAGES:** 13 PAGES (including front page)

**INSTRUCTIONS:** ANSWER ALL THE QUESTIONS ON THE PAPER IN PEN

SHOW ALL CALCULATIONS

CALCULATORS ARE NOT ALLOWED

**Question 1 [10]**

1. Determine whether the following statements are true or false. If false, explain why or give an example. [10]

Statement	True or False & Explanation
$\sin x + \cos x = 1$	
The domain of $y = \sec x$ is the set of all the real numbers.	
$\sin^{-1} x = \frac{1}{\sin x}$	
$\tan(\tan^{-1} 4) = 4$	
The range of $y = \cos^{-1} x$ is $-1 \leq y \leq 1$	

**Question 2 [10]**

The following questions are multiple choice questions. There is only one correct answer from the choices given. Select the correct option by marking the option with an **X**

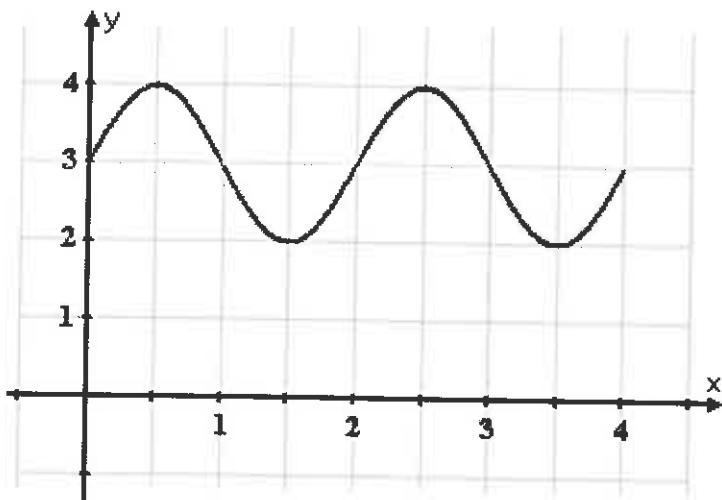
1. The maximum value of  $y = \sin x$  is

- a. 0
- b. 1
- c. -1
- d.  $2\pi$
- e. None of the above

2. The minimum value of  $y = 3 \tan x$  is

- a. 0
- b. 3
- c. -1
- d. -3
- e. None of the above

3. The equation of the graph in the diagram below is



- a.  $y = \sin \pi x + 4$
- b.  $y = \sin \pi x + 3$
- c.  $y = \cos 4\pi x$
- d.  $y = 4 \cos \pi x$
- e. None of the above

4.  $\sec(2\pi - \theta) \sin\left(\frac{\pi}{2} - \theta\right) =$

- a. 1
- b. -1
- c.  $\cos^2 \theta$
- d.  $\sin^2 \theta$
- e. None of the above

5. If  $x = 30^\circ$  and  $y = 45^\circ$  then  $\frac{1}{2}\sin(2x + 4y) =$

- a.  $-\frac{\sqrt{3}}{4}$
- b.  $\frac{\sqrt{3}}{2}$
- c.  $\frac{\sqrt{3}}{4}$
- d.  $-\frac{1}{4}$
- e. None of the above

**Question 3 [21]**

1. Convert  $\frac{5\pi}{12}$  to degrees. [2]

2. Find the positive and the negative coterminal angle of  $\frac{\pi}{5}$ . [4]

3. Find the value of  $\cos \frac{\pi}{3}$  [2]

4. Find the value of  $\sin^{-1}\left(-\frac{1}{\sqrt{2}}\right)$  [2]

5. Find the value of  $\tan\frac{3\pi}{4}$  [3]

6. Find the value of  $\tan\frac{5\pi}{12}$  [4]

7. Find the value of  $\tan \left[ \cos^{-1} \left( -\frac{3}{5} \right) \right]$  [4]

**Question 4** [12]

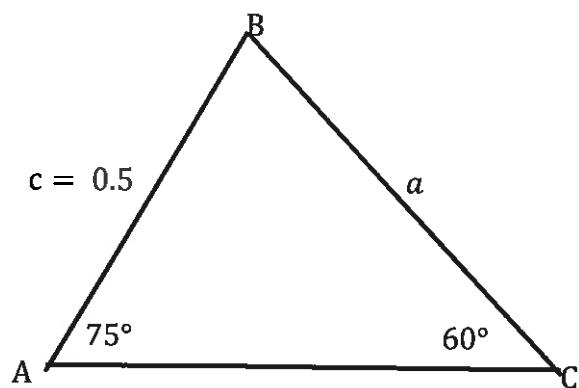
1. If  $\tan \theta = -\frac{4}{3}$  and  $\cos \theta < 0$ , find:

1.1  $\sec \theta$  [3]

1.2  $\sin 2\theta$  [2]

2. Find the length of the arc of a circle of radius 3mm that subtends an angle of  $45^\circ$ . [3]

3. Calculate  $a$  [4]



Question 5 [13]

1. Simplify  $2 \sec \theta \cot \theta - \csc \theta$  [4]

3. Verify the identity

[4]

$$\frac{1}{1 - \sin x} - \frac{1}{1 + \sin x} = 2 \sec x \tan x$$

2. Prove that

[5]

$$\frac{\cos x \cot x}{1 - \sin x} - 1 = \csc x$$

**Question 6 [16]**

1. Solve  $\sin x = -\frac{1}{2}$  [2]

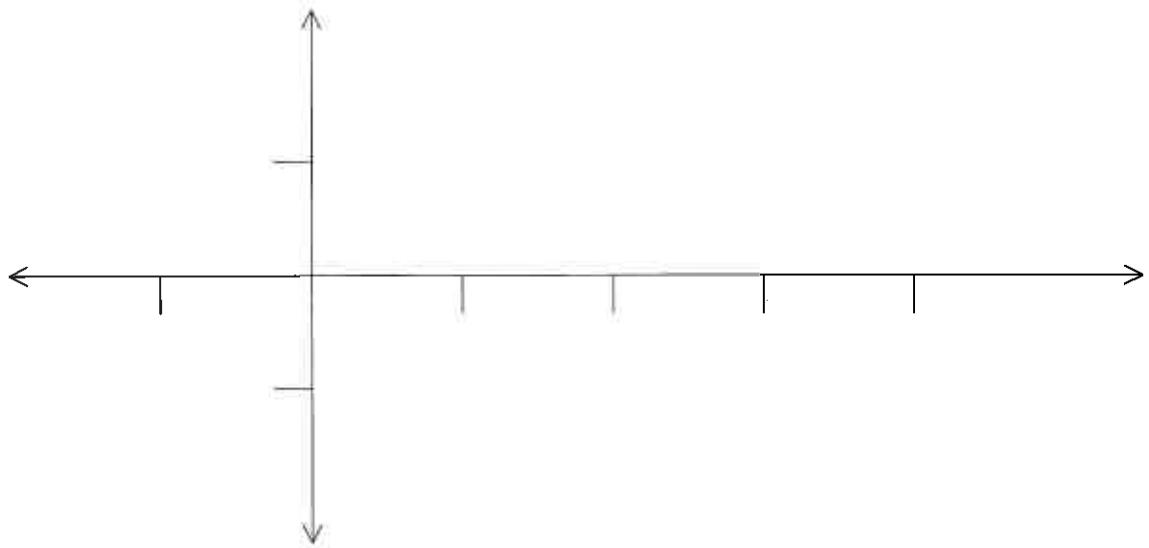
2. Solve  $2 \tan^2 x + \tan x - 3 = 0$  [4]

3. Solve  $\csc^2 3x - 2 = 0$  [5]

4. Solve  $\cos 2x - 3 \cos x - 1 = 0$  [5]

**Question 7 [18]**

1. Graph the function  $y = \sec x$ , on the interval  $[-\frac{\pi}{2}, 2\pi]$ .  
(use the provided set of axes). Show clear readings on both axes. [3]



2. Sketch  $y = \tan^{-1} x$  [3]

3. Sketch  $y = \tan \pi x$ , on the interval  $[-1, 1]$  [3]

4. Sketch  $y = 1 - 2 \csc x$ , on the interval  $[-\frac{\pi}{2}, 2\pi]$ . [4]

5. Sketch  $y = 3 \sin\left(x - \frac{\pi}{4}\right)$ , on the interval  $[-\pi, 2\pi]$ . [4]