## Seat No.

## College of Industrial Technology King Mongkut's University of Technology North Bangkok

Final Examination of Semester 1			Year: 2017
Subject: 394171 Mathematics I			Section: 15-18
Date	28 November 2017		Time 13:00-16:00
Name _		ID	Class

## Instructions

- 1. The examination has 11 pages (including this page) and a total score of 100 Write all your solutions and answers on this examination sheet.
   This is a closed book examination.

- 4. You are not allowed to leave the examination room during the first 1 hour after the beginning of the examination.
- 5. You are not allowed to open the exam papers or start to answer before the proctor's permission.
- 6. You are not allowed to use the restroom during the exam except in case of an emergency.
- 7. No documents are allowed to be taken out of the examination room.
- 8. Calculators are not allowed in the examination.
- 9. Electronic communication devices are NOT allowed in the examination room.

Cheating In the exam is considered an extremely serious offence which will result in expulsion from the University

Question 1 1.1 Find the inverse function of  $f(x) = \frac{x}{1-x}$ . (5 marks)

1.2 Find the value of  $\frac{f(-1)+f^{-1}(1)}{f^{-1}\left(\frac{-1}{2}\right)}$ . (5 marks)

Question 2 2.1 Given  $a \in R$  and two functions f(x) = 5x + a and  $g(x) = \frac{x}{x+2}$ , if  $(g \circ f)(a) = 0$ , find the value of  $a^3 - 2a^2 + a + 1$ . (5 marks)

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2. 2 Compute the value of  $(f^{-1} \circ g^{-1})(a)$ . (5 marks)

Question 3 3.1 Find the value of the expression

$$\left(\sin^2\frac{13\pi}{6} + \cos^2\frac{5\pi}{6}\right) + \left(\sec^2\frac{2\pi}{3} - \tan^2\frac{5\pi}{3}\right) + \left(\csc^2\frac{3\pi}{4} - \cot^2\frac{7\pi}{4}\right). \quad \text{(5 marks)}$$

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3.2 Given the trigonometric equation  $\tan\frac{5\pi}{4} - \sin^2\frac{2\pi}{3} = x\cos\frac{7\pi}{4}\sin\frac{3\pi}{4}\tan\frac{4\pi}{3}$ . Find the value of x.(5 marks)

Question 4 4.1 Evaluate the expression 
$$\frac{\sin(-420^\circ)\cot 210^\circ + \sqrt{3}\cot(-390^\circ)}{\cos(-840^\circ)}.$$
 (5 marks)

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**4.2** Use the value of the trigonometric function,  $4\tan\theta=7$ , where  $\theta\in\left[\pi,\frac{3\pi}{2}\right]$  to evaluate the indicated function  $\frac{3\sin\theta-2\cos\theta}{\sin\theta+\cos\theta}$ . (5 marks)

Question 5 5.1 Find the value of x from the simplify expression

$$\sec\theta\,\cos ec(90^\circ-\theta)-x^2\cot(90^\circ-\theta)=1\,. \tag{5 marks}$$

5.2 Use trigonometric identities to transform the left hand side of the equation

into the right hand side:

$$\sqrt{1 + \cot^2 \theta} \cdot \sqrt{\csc^2 \theta \tan^2 \theta - 1} \cdot \sqrt{1 - \sin^2 \theta} = 1.$$
 (5 marks)

Question 6 6.1 Evaluate the expression  $\cos 20^\circ \, \cos 70^\circ - \sin 20^\circ \, \sin 70^\circ$  . (5 marks)

6.2 If  $A \in Q_2$  and  $B \in Q_3$  where  $24 \tan A_1 + 3 = 0$  and  $3 - 4 \tan B = 0$ , find the value of  $\cos(A + B)$ . (5 marks)

Question 7 7.1 Given A + B = 225, find the value of  $\frac{\tan A \tan B}{(1 - \tan A)(1 - \tan B)}$ . (5 marks)

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7.2 Evaluate the value of  $\cos 70^{\circ} \cos 50^{\circ} \cos 10^{\circ}$ . (10 marks)

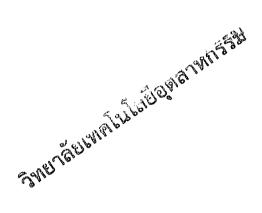
Question 8 8.1 Determine the exact value of  $\arcsin\left(\cos^2\frac{\pi}{12}-\sin^2\frac{5\pi}{12}\right)$ . (5 marks)

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8.2 Use some inverse trigonometric properties to evaluate the exact value of  $\sin(\arctan 2 + \arctan 3)$ . (5 marks)

Question 9 9.1 Solve the trigonometric equation

$$\cos x = \sqrt{3} - \sqrt{3} \sin x$$
,  $x \in [0, 4\pi]$ . (5 marks)



**9.2** Give the trigonometric equation and find the solutions in term of an inverse trigonometric function. (5 marks)

$$\cos(2\arccos(1-x)) = x^2$$

Question 10 Two fire-spotting towers are 7 kilometers apart on an east–west line. From Tower A a fire is seen on a bearing of  $310^\circ$  (clockwise from the north). From Tower B the same fire is spotted on a bearing of  $020^\circ$  (clockwise from the north). Which tower how far is that tower from the fire? ( $\sin 20^\circ = 0.342$ ) (10 marks)

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