Seat No.

College of Industrial Technology

King Mongkut's University of Technology North Bangkok

Final Examination of Semester 1 Year: 2018

Subject: 394171 Mathematics I Section: 15-18

Date 27 November 2018 Time 13:00-16:00

Name _____ ID_____ Class_____

Instructions

1. The examination has 10 pages (including this page) and a total score of 90 points.
2. Write all your solutions and answers on this examination sheet.
3. 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 Given the function $f(x)=\frac{x+2}{x-2}$ and $g(x)=x^2$.

Find $f^{-1}(x)$ and $D_{f^{-1}}$. (5 marks)

1.2 Determine the value of $(f\circ g)(3)+\sqrt{f^{-1}(3)}$. (5 marks)

Question 2 2.1 Given the following functions

$$f=\{(-3,1),(0,4),(2,0)\},\ g=\{(-3,2),(1,3),(2,6)\}$$

and $h=\{(2,3),(1,0)\}$. Find the following functions $f+g$, fg, $\frac{g}{h}$, $h\circ f$. (6 marks)

2.2 Find f^{-1}, g^{-1}, $f^{-1}\circ g^{-1}$, $h\left(f^{-1}(0)\right)$. (4 marks)

Question 3 3.1 Determine whether the following statements are True or False.(5 marks)

1. $\cos\left(\frac{\pi}{2}+\frac{\pi}{3}\right)=\cos\frac{\pi}{2}\cos\frac{\pi}{3}$
2. $\sin\frac{\pi}{3}\cos\frac{\pi}{6}+\cos\frac{\pi}{3}\sin\frac{\pi}{6}=1$
3. $\sin\frac{\pi}{6}+\sin\frac{\pi}{3}=\sin\frac{\pi}{2}$
4. $\cos\frac{\pi}{6}+2\cos\frac{\pi}{3}=\cos\frac{5\pi}{6}$
5. $\cos\frac{\pi}{4}+\sin\frac{\pi}{4}=\sqrt{2}\sin\frac{\pi}{2}$

3.2 Determine the value of the expression

$$\frac{3\tan^2 135^\circ-\sec^2 300^\circ}{2\sin 330^\circ}+\frac{\cot\left(-480^\circ\right)-\csc\left(-840^\circ\right)}{\cos\left(-390^\circ\right)}.$$ 5 marks)

Question 4 4.1 Evaluate the value of $\sin\frac{11\pi}{12}$. (5 marks)

4.2 Evaluate the value of $\cos\frac{5\pi}{12}\cos\frac{\pi}{4}+\sin\frac{5\pi}{12}\sin\frac{\pi}{4}$. (5 marks)

Question 5 5.1 If $\cos\theta = \frac{3}{5}$ and $270° < \theta < 360°$, find the value of $\sin 2\theta$. (5 marks)

5.2 Find the exact value of $\tan\theta$, if $\cos 2\theta = \frac{4}{5}$ and $0° < 2\theta < 90°$. (5 marks)

Question 6 6.1 Evaluate the value of $\sin^2 A+\sin^2(60°+A)+\sin^2(60°-A)$. (5 marks)

6.2 Evaluate the value of $\cos 68°\cos 78°+\cos 22°\cos 12°-\cos 10°$. (5 marks)

Question 7 7.1 Find the exact value of $\tan\left(\arcsin\frac{2}{3}\right) - \cot\left(\arctan\frac{5}{8}\right)$. (5 marks)

7.2 Find the exact value of $\arcsin\left(\frac{-\sqrt{2}}{2}\right) + \arccos\left(\frac{1}{2}\right) + \arctan\left(-\sqrt{3}\right)$. (5 marks)

Question 8 8.1 Determine the exact value of $\cos\left(\arccos\frac{4}{5}+\arcsin\frac{1}{\sqrt{10}}\right)$. (5 marks)

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

$$\csc^2 x - 2\cot x = 4.$$

Question 9 Two boats are 400 feet apart on opposite sides of a lighthouse. If the angles on elevation from two boats to the top of the lighthouse are 20° and 15° respectively. How tall is the lighthouse? ($\cot 20^\circ = 2.748$ and $\cot 15^\circ = 3.732$) (10 marks)

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