

MTH 114, Exam II, Fall 2003
1:00 – 2:15 pm, Nov.20, 2003
Instructor: Govind Menon

Your Name: _____

Please circle your TA's name and your section:

Liming Lin 1:20pm 2:25 pm
Tal Sutton 9:55 am 11:00 am
Yudong Tang 12:05pm 3:30 pm
Jiayou Wang 7:45am 8:50 am

Question	Points	Maximum
Q.1		15
Q.2		10
Q.3		10
Q.4		15
Q.5		10
Q.6		15
Q.7		15
Q.8		10
Total		100
Scaled total		100

Instructions

1. **Show your work** : you may get partial credit.
2. No books or notes.
3. This exam is worth 20% of your course grade.
4. You may use a calculator, but not a graphing calculator. Check that you're using your calculator in the right mode (degrees or radians).
5. Answer as many questions as you can. The mean will be scaled to 70/100.

Question 1: Evaluate the following expressions exactly. *Do not use your calculator.* You may express your answer as a fraction.
((a)–(e) 3 points each))

(a) $\log_9 1$

(b) $\cos \frac{\pi}{6}$

(c) $\tan 210^\circ$

(d) $\log_2 (4^{-3})$

(e) $e^{\sin 8\pi}$

Question 2: (10 points) Graph both the following functions on the same picture. Indicate at least two periods of oscillation in your picture, and mark the amplitude of oscillation, and zeros clearly.

a. $3 \sin 2x$.

b. $\sin(x + \pi/4)$.

Question 3: (10 points) An angle θ lies in the third quadrant, and $\tan \theta = 2/7$. Find $\sin \theta$, $\cos \theta$, $\sec \theta$, $\csc \theta$, $\cot \theta$ exactly.

Question 4: (15 points) A pond is stocked with 1400 trout. Six months later, 500 remain.

- a. (8 points) Find a formula of the form $N = N_0 e^{ct}$ that can be used to estimate the number of trout after t months (that is, find numbers N_0 and c that fit the information given).
- b. (7 points) Sketch a graph of N as a function of t .

Question 5: (10 points) Solve the following equation exactly

$$e^x + 2 = 8e^{-x}$$

Question 6: (15 points) Sketch the graph of the rational function

$$f(x) = \frac{x^2 - 4x + 4}{x + 1}.$$

Indicate clearly all zeros of f and all asymptotes.

Question 7: (15 points) A motorist is traveling along a level highway directly towards a mountain at a speed of 60 mph. He observes that between 2:00pm and 2:15 pm, the angle of elevation of the top of the mountain changes from 20° to 75° . Approximate the height of the mountain.

Question 8: (10 points) The length L of a fish is related to its age by means of the growth formula

$$L = a(1 - be^{-kt})$$

where a , b and k are positive constants that depend on the type of fish. Solve this formula for t to estimate the age of a fish from a length measurement. (Your answer should be an expression for t in terms of a , b , k and L).