



Prince Sultan University
Orientation Mathematics Program

MATH 002

Midterm Examination

Semester II, Term 082

Monday, April 20, 2009

Time Allowed: 100 minutes

Student Name: _____

Student ID #: _____

Section #: _____

Teacher's Name: _____

Important Instructions:

1. You may use a scientific calculator that does not have programming or graphing capabilities.
2. You may NOT borrow a calculator from anyone.
3. You may NOT use notes or any textbook.
4. There should be NO talking during the examination.
5. Your exam will be taken immediately if your mobile phone is seen or heard
6. Looking around or making an attempt to cheat will result in your exam being cancelled
7. This examination has 17 problems, some with several parts. Make sure your paper has all these problems.

Problems	Max points	Student's Points
1,2,3,4	19	
5,6,7	20	
8,9,10,11	19	
12,13	13	
14,15	16	
16,17	13	
Total	100	

Q.1 (8 points)

- (i) Begin by graphing $f(x) = e^x$, then use transformations of this graph to graph $g(x) = -e^{x-1} + 2$.

- (ii) Determine the domain and range of $g(x) = -e^{x-1} + 2$.

Q.2 (3 points) Find the domain of the function $h(x) = \ln(x-7)^2$.

Q.3 (4 points) Expand the logarithmic expression as much *as possible*: $\log_b \left(\frac{\sqrt[3]{x} \cdot y^4}{z^5} \right)^7$.

Q.4 (4 points) Condense the logarithm. Write the expression as a single logarithm.
 $\log x + \log(x^2 - 4) - \log 15 - \log(x + 2)$.

Q.5 (10 points) Solve the following equations:

(i) $e^{4x} + 5e^{2x} - 24 = 0.$

(ii) $2\log_3(x + 4) = \log_3 9 + 2.$

Q.6 (5 points) Find the length of the arc on a circle of radius 8 feet intercepted by a central angle 225° . Round your answer to two decimal places.

Q.7 (5 points) Use a **sketch** to find the **exact** value of: $\tan\left(\cos^{-1}\frac{\sqrt{2}}{5}\right).$

Q.8 (6 points) Given that $\cos \alpha = -\frac{4}{5}$, α lies in quadrant *III*, and $\sin \beta = \frac{\sqrt{21}}{5}$, β lies in quadrant *I*. Find $\cos(\alpha + \beta)$

Q.9 (3 points) Use a *calculator* to find the value of the following, rounded to two decimal places:

(i) $\tan 32.7^\circ =$

(ii) $\cos^{-1} \frac{\sqrt{5}}{7} =$

(iii) $\sec \frac{\pi}{8} =$

Q.10 (5 points) Let $P = (5, -5)$ be a point on the terminal side of angle θ . Find the exact value of each of the six trigonometric functions of θ .

Q.11 (5 points) At a certain time of day, the angle of elevation of the sun is 40° . To the nearest foot, find the height of a tree whose shadow is 35 feet long.

Q.12 (4 points) Find the exact value of the expression.
Do not use a calculator. (Show your work)

$$\sin \frac{3\pi}{4} \cdot \cos \frac{5\pi}{6} + \cos \frac{3\pi}{4} \cdot \sin \frac{5\pi}{6}$$

Q.13 (9 points) Use the reference angle (*not a calculator*) to find the exact value of

(i) $\tan 210^\circ$

(ii) $\csc\left(-\frac{17\pi}{6}\right)$

(iii) $\cos \frac{3}{4}\pi$

Q.14 (8 points) Consider the function: $y = -3\sin\left(2x + \frac{\pi}{2}\right)$.

(i) Determine the amplitude, period and phase shift.

(ii) Graph one period of the function. Show all works.

Q.15 (8 points) Verify each identity

(i)
$$\frac{\sin \theta}{\cos \theta + 1} + \frac{\cos \theta - 1}{\sin \theta} = 0$$

(ii)
$$\frac{\sin x}{1 + \cos x} = \csc x - \cot x$$

Q.16 (8 points) Solve the equations

(i) $5 \tan x = 2 \tan x + \sqrt{3}$, $0 \leq x < 2\pi$

(ii) $2 \sin^2 x = 3 \sin x - 1$, $0 \leq x < 2\pi$

Q.17 (5 points) The function $f(x) = 1 + 1.6 \ln(x + 1)$ models the average number of free-throws a basketball player can make consecutively during practice where x is the number of consecutive days the basketball player has practiced for. After how many days of practice can the basketball player make an average of 6 consecutive free throws?