Prince Sultan University
Orientation Mathematics Program
MATH 002
Final Examination
Semester II, Term 082
Tuesday, June 23, 2009
Time Allowed: 150 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. Provide an organized complete solution for each Question.
8. This examination has 19 problems. Make sure your paper has all these problems.

Problems	Max. points	Student's Points
1,2,3,4,5	17	
6,7,8	17	
9,10,11	15	
12,13	12	
14	8	
15,16	14	
17,18,19	17	
Total	100	

Q.1 (3 points) Use properties of logarithms to expand the logarithmic expression $\log_2\left(\frac{16}{x^3.\sqrt{x-1}}\right)$ as much as possible.

Q.2 (4 points) Solve the logarithmic equation $\log_3(x+2)-\log_3 x=2$.

Q.3 (5 points) Solve the following equation. $3\cos^2 x=\sin^2 x$; $0\le x\le 360^\circ$

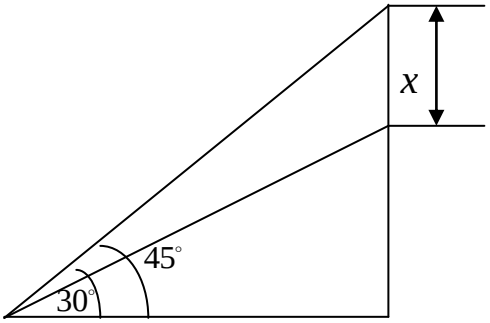
Q.4 (3 points) Let $(21,28)$ be a point on the terminal side of the angle θ.
Find the exact value of $\csc\theta$.

Q.5 (2 points) **Use a calculator** to find the value of the expressions rounded to two decimal places:

i) $\sec 55^\circ =$

ii) $\sin^{-1}\left(\frac{\sqrt{5}}{3}\right)=$

Q.6 (5 points) Use the graph to find the distance x , rounded to two decimal places.



Q.7 (4 points) A building 290 feet tall casts a 40 foot long shadow. If a person stands at the end of the shadow and looks up to the top of the building, what is the angle of the person's eyes to the top of the building (to the nearest tenth of a degree)?

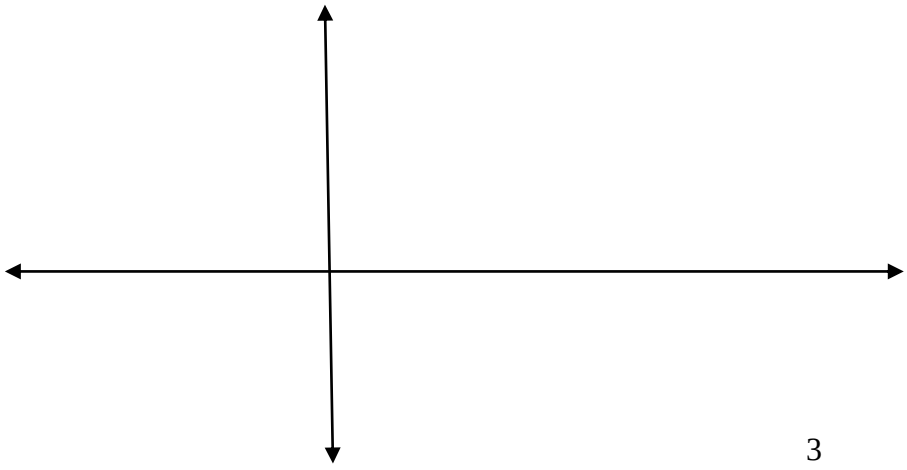
Q.8 (8 points) Consider the equation $y = 4\cos\left(2x - \frac{\pi}{3}\right)$.

i) Find the amplitude

ii) Find the period

iii) Find the phase shift

iv) Graph one period of y .



Q.9 (6 points) Find the **exact** value of each of the following expressions **without** using a calculator.

i) $\cos\left(\tan^{-1}-\frac{4}{5}\right)$ (Hint: Use a sketch and show all your steps)

ii) $\cos 50^\circ \cos 10^\circ - \sin 50^\circ \sin 10^\circ$

iii) $\sec\frac{-3\pi}{4}$ (Hint: Use reference angles)

Q.10 (5 points) Find $\sin(\alpha-\beta)$ if $\sin\alpha=\frac{12}{13}$, α lies in quadrant II and $\cos\beta=\frac{15}{17}$, β lies in quadrant I.

Q.11 (4 points) Solve the following system: $\begin{aligned} 2x+y &= 8 \\ 8x+4y &= 32 \end{aligned}$

Q.12 (6 points) Let $A=\begin{bmatrix}2 & -1 & 3\\ 0 & 4 & -2\end{bmatrix}$, $B=\begin{bmatrix}-3 & 1\\ 2 & 5\end{bmatrix}$, and $C=\begin{bmatrix}3 & -2\\ 0 & -1\\ 1 & 2\end{bmatrix}$

Perform the following operations, if possible.

i) $A.C+B$

ii) B^{-1}

Q.13 (6 points) Use the **elimination method** to solve the following system of equations:

$$2x+2y-z=5$$
$$3y-z=2$$
$$-x-2y+z=-3$$

Q.14 (8 points) Use the Gaussian elimination to find the solution of : $\begin{cases} 3x + y + z - 2w = 10 \\ 2x + 3y + 3z + w = -5 \\ 2x + y + 4z + 11w = 11 \end{cases}$.

(Write the solution set.)

Q.15 (7 points) If $A = \begin{bmatrix} 1 & 0 & 7 \\ 2 & 1 & -1 \\ 7 & 3 & 1 \end{bmatrix}$

i) Find the determinant of A .

ii) Does matrix A have an inverse? Give the reason.

iii) Use Cramer's Rule to solve the system of equations **for x only**:

$$\begin{aligned} x + 7z &= 2 \\ 2x + y - z &= 1 \\ 7x + 3y + z &= -4 \end{aligned}$$

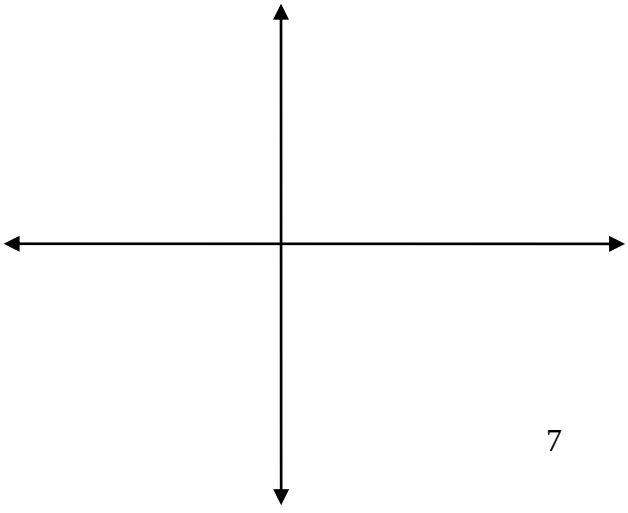
Q.16 (7 points) Consider the following equation of conic section.

$$4x^2 + y^2 - 8x + 2y - 11 = 0$$

i) Identify the conic section as parabola, hyperbola, or ellipse

ii) Find the center, vertices, and the foci

iii) Graph the conic section



Q.17 (7 points) $\frac{(x+3)^2}{4} - \frac{(y-4)^2}{9} = 1$ is an equation of a hyperbola,

(i) Find the center, vertices, and foci of the hyperbola

(ii) Give the equations of the asymptotes.

Q.18 (5 points) Find the standard form of the equation of the ***parabola*** whose focus is at $(2,5)$ and its directrix is vertical and passes through $(-4,5)$

Q.19 (5 points) Graph the solution set of the system: $\begin{cases} 3x - y \le -3 \\ x + 2y \ge 6 \end{cases}$.