Prince Sultan University
Orientation Mathematics Program
MATH 002
Final Examination
Semester I, Term 081
Wednesday, February 4, 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 heard
6. Looking around or making an attempt to cheat will result in your exam being cancelled
7. This examination has 19 problems, some with several parts. Make sure your paper has all these problems.

Problems	Max points	Student's Points
1,2,3	13	
4,5,6	15	
7,8	15	
9,10	12	
11,12,13	15	
14,15,16	12	
17,18	11	
19	07	
Total	100	

Q.1 (3 points) Evaluate each of the following expressions using your calculator:

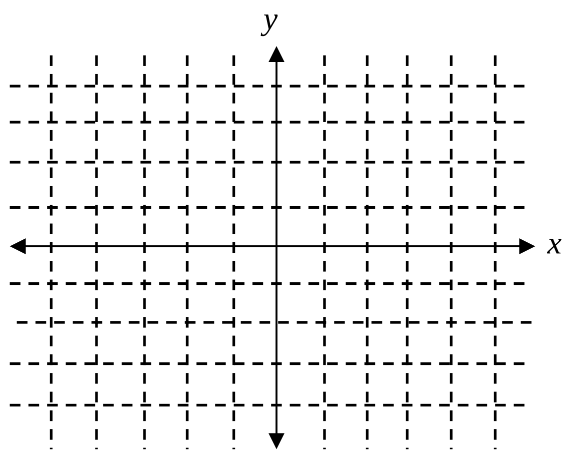
(i) $\frac{15}{20}\pi$ radians=_______________degrees

(ii) $\csc(-420^\circ) =$

(iii) $\cot^{-1}(0.26) =$

Q.2 (4 points) Condense the logarithmic expression: $\frac{1}{5}\left[4\ln(x+9) - \ln x - \ln(x^2 - 10)\right]$.

Q.3 (6 points) Graph the function $f(x) = \log_2(x+3) - 1$ and write the domain of $f(x)$ in interval notation.



Q.4 (6 points) The point $(3,-4)$ is on the terminal side of angle θ. Find the exact value of each of the six trigonometric functions of θ.

Q.5 (4 points) Find the length of the arc on a circle of radius $r = 5$ meters intercepted by a central angle $\theta = 70^\circ$. Round answer to two decimal places.

Q.6 (5 points) Find the exact value of $\cos(\alpha + \beta)$ if $\cos\alpha = \frac{-4}{5}$ and $\cos\beta = \frac{5}{8}$, and if the terminal side of α lies in Quadrant III and the terminal side of β lies in Quadrant IV.

Q.7 (6 points) Find the **exact value** of the following expressions without using calculator: (Show all your steps)

(i) $\csc\left(\frac{7\pi}{4}\right)$

(ii) $\tan\left(\cos^{-1}\left(-\frac{1}{2}\right)\right)$

Q.8 (9 points) Solve the following equations

(i) $10^{x^2-6} = 1000$.

(ii) $3 + 4\ln(2x) = 15$.

(iii) $2\sin^2\theta - \sin\theta - 1 = 0$ over the interval $0 \le \theta < 2\pi$.

Q.9 (6 points) Graph the hyperbola with the equation: $(x+3)^2 - 36(y-4)^2 = 36$. (Locate the foci and show the asymptotes).

Q.10 (6 points) Verify the following identities:

(i) $\dfrac{\sin x}{1-\cos x} = \csc x + \cot x$

(ii) $\cos x\,(1+\tan^2 x) = \sec x$

Q.11 (6 points) Consider the equation of conic section: $4x^2 + y^2 - 8x + 2y - 11 = 0$.

(i) Is this a hyperbola or ellipse.

(ii) Find the center, vertices and the foci.

Q.12 (4 points) Find the standard form of the equation for the parabola with vertex $(1,5)$ and focus $(7,5)$.

Q.13 (5 points) From a boat on the lake, the angle of elevation to the top of a mountain is 33° . If the base of the mountain is 667 meters from the boat, how high is the mountain (to the nearest meter)?

Q.14 (3 points) The function $f(t) = \dfrac{500000}{1+5000e^{-t}}$ models the number of people, $f(t)$, in a city who have become ill with influenza t weeks after its initial outbreak. How many people were ill by the end of the fourth week?

Q.15 (6 points) Let $A = \begin{bmatrix} 0 & -2 & 7 \\ 5 & 4 & 3 \end{bmatrix}$, $B = \begin{bmatrix} 3 & 1 \\ -1 & 5 \\ 6 & 0 \end{bmatrix}$ and $C = \begin{bmatrix} 2 & -6 \\ 4 & -8 \end{bmatrix}$.

Find the matric X if $3X + 2C = AB.$

Q.16 (3 points) Find the amplitude, period and phase shift of the function: $y = -3\cos(\pi x - 2)$.

Q.17 (6 points) Solve the system $\begin{cases} x + 7z = 4 \\ 2x + y - z = 1 \\ 7x + 3y + z = 4 \end{cases}$ using **Cramer's Rule**.

Q.18 (5 points) Solve $\begin{cases} x + 2y + 3z = -2 \\ x + y + z = -11 \\ 2x + 2y + z = 8 \end{cases}$ using that the inverse of $\begin{bmatrix} 1 & 2 & 3 \\ 1 & 1 & 1 \\ 2 & 2 & 1 \end{bmatrix}$ is $\begin{bmatrix} -1 & 4 & -1 \\ 1 & -5 & 2 \\ 0 & 2 & -1 \end{bmatrix}$.

Q.19 (7 points) Solve the following system of linear equations $\begin{cases} x+2y-z=5 \\ 2x-y+3z=0 \\ 2y+z=1 \end{cases}$.

(Use Gaussian elimination method or Gauss-Jordan method**)**