Prince Sultan University
Department of Mathematical Sciences

MATH 002
Final Examination
Semester II, Term 112
Sunday, May 24, 2012
Time Allowed: 120 minutes

Student Name: _____

Student ID #: _____ Section #: _____

Teacher's Name: _____

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. If your mobile phone is seen or heard, your exam will be taken immediately.
6. You must show all your work beside the problem. Be organized.
7. You may use the back of the pages for extra space, but be sure to indicate that on the page with the problem.
8. This examination has 15 problems. Make sure your paper has all these problems.

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

Q.1 (4 points) Given $f(x) = 2 - \log_3(x+1)$

a) find the **Domain** and **Range** of f

b) Give the equation(s) of the horizontal **and /or** the vertical asymptote of f.

Q.2 (10 points) Solve each of the following equations.

a) $2^{12-5x} - 7 = 123$

b) $\log_4(-3+2x) - \log_4(x-3) - \log_4(x+5) = 0$

Q.3 (4 points) Verify the identity:

$$\frac{1}{\sin(\alpha)+\cos(\alpha)} + \frac{1}{\sin(\alpha)-\cos(\alpha)} = \frac{2\sin(\alpha)}{\sin^4(\alpha)-\cos^4(\alpha)}$$

Q.4 (5 points) Evaluate $\sin\left(\frac{\pi}{12}\right)$ **(without using calculators and Show all your steps).**

Q.5 (5 points) If $\sin\theta = \frac{1}{4}$ and θ is acute angle, find the exact value of $\cos\left(\theta + \frac{\pi}{3}\right)$.

Q.6 (5 points) Use a sketch to find the *exact value* of $\sin\left(\tan^{-1}(-\frac{2}{5})\right)$

(Don't use a calculator and Show all your steps).

Q.7 (3 points) Determine the amplitude, period, and phase shift for the trigonometric function $y = \frac{5}{2}\sin\left(2x - \frac{\pi}{3}\right)$ **<u>(Don't Graph)</u>**

Q.8 (9 points) Solve the following system by **Gaussian elimination** or by **Gauss-Jordan elimination:**

$$w - 2x - y - 3z = -9$$
$$w + x - y = 0$$
$$3w + x + z = 6$$

Q.9 (9 points) Let $A=\begin{bmatrix}2 & -1 & 3\\ 1 & 4 & -2\\ 5 & 1 & 0\end{bmatrix}$, $B=\begin{bmatrix}1 & 5 & 0\\ -3 & 0 & 2\\ 2 & 1 & 4\end{bmatrix}$, $C=\begin{bmatrix}1 & 2\\ -3 & 1\\ 2 & 4\end{bmatrix}$

Find each of the following. If the operation is undefined just say undefined:

a) $2A-3B$

b) AB

c) CB

Q.10 (8 points) **Graph** the solution set of the system $\begin{cases}\dfrac{(x-2)^2}{9}+\dfrac{(y+1)^2}{4}\le 1\\ 2x+y>1\end{cases}$

Q.11 (6 points) Solve the system: $\begin{aligned} 3(x-2y)+5x &= 8y+18 \\ 2x+7(y+x) &= 3x+11 \end{aligned}$

Q.12 (6 points) Use **Cramer's Rule** to solve the system of equations:

$$\begin{aligned} x+2z &= 4 \\ 2y-z &= 5 \\ 2x+3y &= 13 \end{aligned}$$

for x only.

Q.13 (6 points) a) Write the standard equation of a parabola whose vertex is $(6,-5)$ and focus is $(4,-5)$.

b) Find the coordinates of x and y- intercepts.

Q.14 (10 points) Let $A = \begin{bmatrix} 1 & 2 & -1 \\ -2 & 0 & 1 \\ 1 & -1 & 0 \end{bmatrix}$.

a) Find A^{-1} if it exists.

b) Solve the system using A^{-1}

$$x + 2y - z = 1$$
$$-2x + z = 2$$
$$x - y = -1$$

Q.15 (10 points) Consider the equation of the hyperbola $4x^2 - 25y^2 - 32x + 164 = 0.$

a) Write the equation in standard form.

b) Give the coordinates of the foci and vertices.

c) Write the equations of asymptotes.

d) Graph the hyperbola.