Prince Sultan University
Department of Mathematical Sciences

MATH 002
Final Examination
Semester I, Term 131
Saturday, January 04, 2014
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 18 problems. Make sure your paper has all these problems.

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

Q.1 (5 points) **Graph** $f(x) = \left(\dfrac{1}{3}\right)^{-x} + 1$. Find and show the intercept(s) and asymptotes(s), if any.
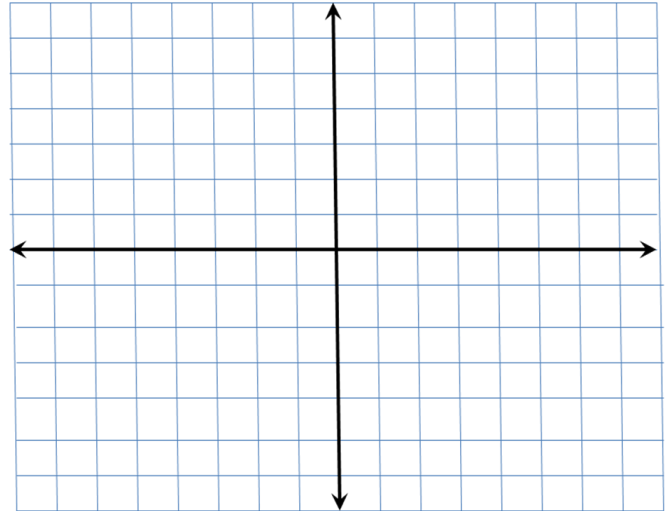
Q.2 (2 points) Determine, **without graphing**, the domain and range for
$$f(x) = -3\log_3(2x-6)+5.$$

Q.3 (8 points) Solve the equations:

a) $\log_3\left(x^2 + 7x - 3\right) = 2 + \log_3(x)$

b) $e^{5x-7} - 3^x = 0$

Q.4 (3 points) Use properties of logarithms to expand the logarithmic expression as much as possible.

$$\log_2\left[\frac{64x^5 \cdot \sqrt[4]{4-x}}{(x+3)^2}\right]$$

Q.5 (5 points) Given that $\sin(\theta) = \dfrac{\sqrt{5}}{3}$ and $\tan(\theta) < 0$, find the remaining trigonometric functions.

Q.6 (5 points) Find $\sin(\alpha + \beta)$ given that $\tan\alpha = \dfrac{-3}{4}$, α lies in Quadrant 2, and $\cos\beta = \dfrac{1}{3}$, β lies in Quadrant 1.

Q.7 (4 points) Verify the trigonometric identity $\dfrac{\sin x + \cos x}{\sin x} - \dfrac{\cos x - \sin x}{\cos x} = \sec x \csc x$

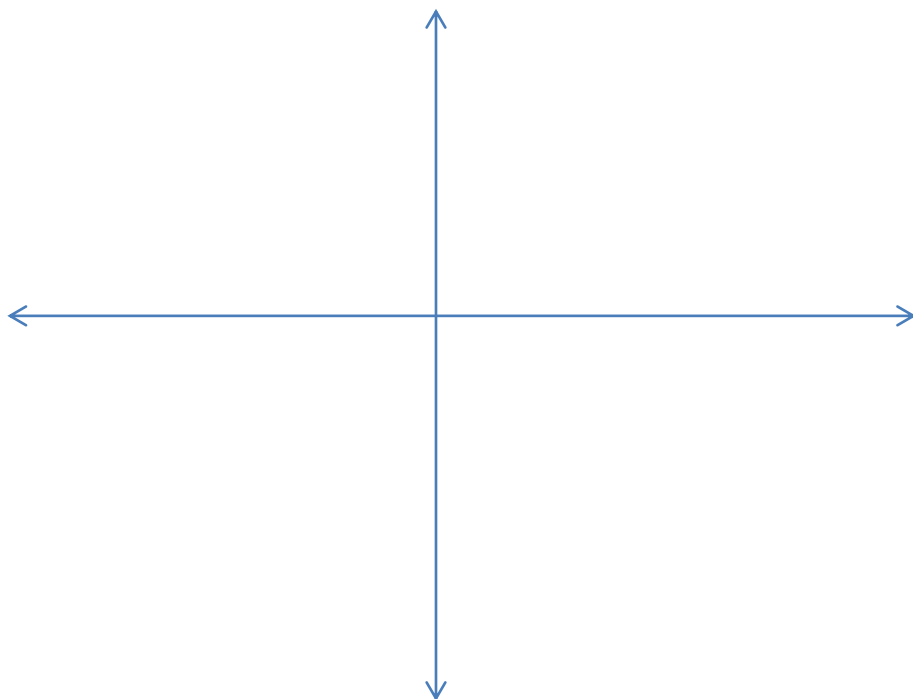Q.8 (8 points)   Find the **exact value** of the following. **Show all your steps**.

a) $\sin\left(\cos^{-1}(-\dfrac{\sqrt{3}}{2})\right)$

b) $\sec(480°)$

c) $\cos 56° \cos 41° + \sin 56° \sin 41°$

Q.9 (7 points) Determine the amplitude, period, and phase shift of the function

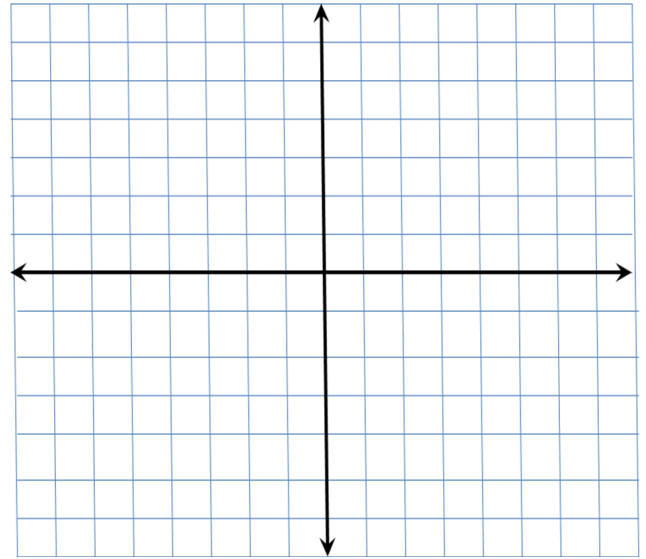$$y = -\, 4\sin\left(\dfrac{x}{4} + \pi\right).$$ Then graph one period.

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Q.10 (6 points) Graph the solution set:

$$2x - 4y > 12$$
$$y \geq x^2 - 7$$
$$y > -5$$

Q.11 (5 points) Solve the following system using Gaussian elimination: $\begin{cases} x + y - 2z = 2 \\ 3x - y - 6z = -7 \end{cases}$

Q.12 (3 points) Evaluate the determinant $\begin{vmatrix} 2 & -2 & 2 & -1 \\ 1 & 0 & 3 & -2 \\ 5 & 0 & 1 & 5 \\ -1 & 0 & 7 & 0 \end{vmatrix}$

Q.13 (5 points) Let $A = \begin{bmatrix} 0 & -2 & -3 \\ 2 & 3 & 1 \end{bmatrix}$, $B = \begin{bmatrix} 0 & 2 \\ -1 & -3 \\ -2 & 4 \end{bmatrix}$ and $C = \begin{bmatrix} 1 & -3 \\ -2 & -12 \end{bmatrix}$

Find $\left\{ \left(\dfrac{1}{2} CA \right) B \right\} - 2I_2$

Q.14 (8 points) Use the inverse of the co-efficient matrix A^{-1} to solve the system:

$$\begin{cases} x + y + z = 6 \\ x + 2y + 3z = 14 \\ x + 4y + 9z = 36 \end{cases}$$

Q.15 (7 points) Use **Cramer's rule** to solve the system: $\begin{cases} x & +2z = 4 \\ 2y - z = 5 \\ 2x + 3y & = 13 \end{cases}$

Q.16 (6 points) Give the coordinates of **the vertices and the foci** and **the equations of the asymptotes** of the conic section given by: $25(y-3)^2 - 4(x+2)^2 = 100$

Q.17 (7 points) Graph $9x^2 + 16y^2 - 18x + 64y - 71 = 0$. Indicate the location of the foci and the vertices.
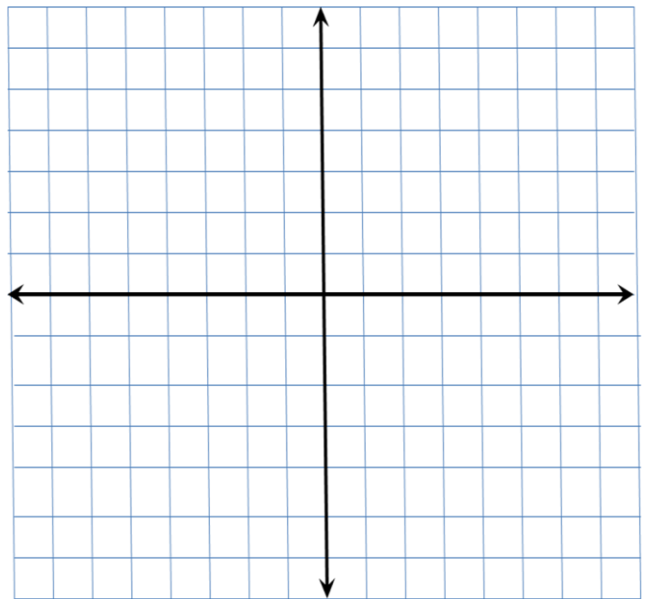
Q.18 (6 points) Graph the parabola and give its vertex, focus, and directrix.

$$\frac{1}{2}(y+3)^2 + 6x - 18 = 0$$