Prince Sultan University
Department of Mathematical Sciences

MATH 002
Final Examination
Semester II, Term 152
Monday, May 23, 2016
Time Allowed: 150 minutes

Student Name: _____

Student ID #: _____

Section							
Dr. Aiman	Dr. Kamal	Dr. Bahaa'	Dr. Jehad		Mr. Khaled		Dr. Thabet
11 --- 12	10 ---- 11	9 ----10	10 --- 11	8 --- 9	11 ---- 12	8 --- 9	1 ---- 2
407	408	409	412	414	411	615	415

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
1,2,3,4	19	
5,6,7	17	
8,9,10	15	
11,12,13	14	
14,15	19	
16,17,18	16	
Total	100	

Q.1 (6 points) Find the solution set for each of the following equations. (Round your answer to 2 decimal places)

a) $5e^{2x-1} + 7 = 27$

b) $\log_5(x-7) + \log_5(x-4) - \log_5(x) = 1$

Q.2 (3 points) Find the domain of $f(x) = \log_5(x^2 - 3x - 4)$

Q.3 (6 points) Given that $\csc\theta = -4$ and $\tan\theta > 0$, find the values of the **remaining trigonometric functions**.

Q.4 (4 points) Write $\tan\left(\sin^{-1}\left(\dfrac{\sqrt{x^2-9}}{x}\right)\right)$ as an algebraic expression. Assume that $x > 0$ and the inverse function is defined for the expression given.

Q.5 (6 points) Find the exact value. **Show all your steps and don't use a calculator directly.**

a) $\cot\left(-\dfrac{35\pi}{6}\right)$

b) $\sin(375°)$

Q.6 (4 points) The function, $S(t) = 21.4(1.56)^t$ models the number of smartphones, S(t), in millions, sold in the United States, t years after 2004. **When (what year)** does this model project that 1170.9 million smartphones will be sold?

Q.7 (7 points) Determine the amplitude, period, and phase shift, then graph one period of:

$$y = -3\cos\left(\dfrac{1}{2}x + \pi\right)$$
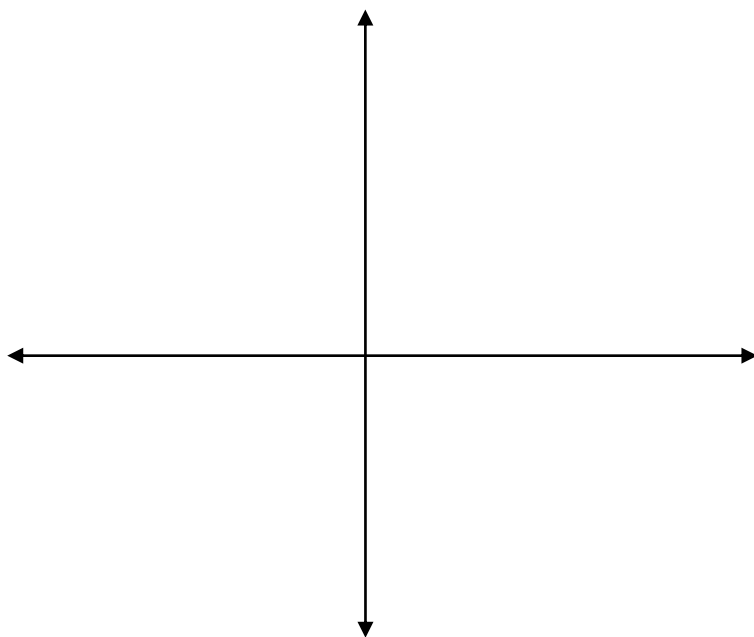
Q.8 (6 points) Solve the following trigonometric equations.

a) $3\cos^2 x = \sin^2 x$; $[0, 2\pi)$

b) $\cos(2x)\cos(x) - \sin(2x)\sin(x) = \dfrac{\sqrt{2}}{2}$; $0 \le x < 360°$

Q.9 (6 points) Verify the identity:

a) $\dfrac{1 - \tan(x)}{\sin(x)} = \csc(x) - \sec(x)$

b) $\sin\left(x + \dfrac{\pi}{6}\right) - \cos\left(x + \dfrac{\pi}{3}\right) = \sqrt{3}\sin(x)$

Q.10 (3 points) Solve for x. $\begin{vmatrix} 1 & x & -2 \\ 3 & 1 & 1 \\ 0 & -2 & 2 \end{vmatrix} = -8$

Q.11 (3 points) Find the value(s) of x so that the matrix $A = \begin{bmatrix} x & 2 \\ 6 & x-1 \end{bmatrix}$ **has no inverse**.

Q.12 (6 points in total) Let $A = \begin{bmatrix} 2 & -1 \\ -3 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} -1 & 2 \\ -3 & 4 \end{bmatrix}$. **Solve** $AX - 2B = B^2 + I_2$ for **X**.

$$
\begin{array}{rcl}
3x - 2y + z & = & 16 \\
\end{array}
$$

Q.13 (5 points) Use **Cramer's rule** to solve the system
$$
\begin{array}{rcl}
3x - 2y + z & = & 16 \\
2x + 3y - z & = & -9 \\
x + 4y + 3z & = & 2
\end{array}
$$
for z only.

Q.14 (9 points) Consider the system $\begin{cases} w + x - y - 9z &=& -3 \\ y + 7z &=& 4 \\ x + 4y + 33z &=& 18 \end{cases}$.

a) Can we use the inverse method to solve this system? Why or why not?

b) Find the solution set of the system using **Gaussian elimination method**.

Q.15 (10 points) Consider the equation: $4x^2 + y^2 + 16x - 6y - 39 = 0$
a) Write the equation in standard form.
b) Identify the conic section. Determine the vertices.
c) Graph the conic section and locate the foci.
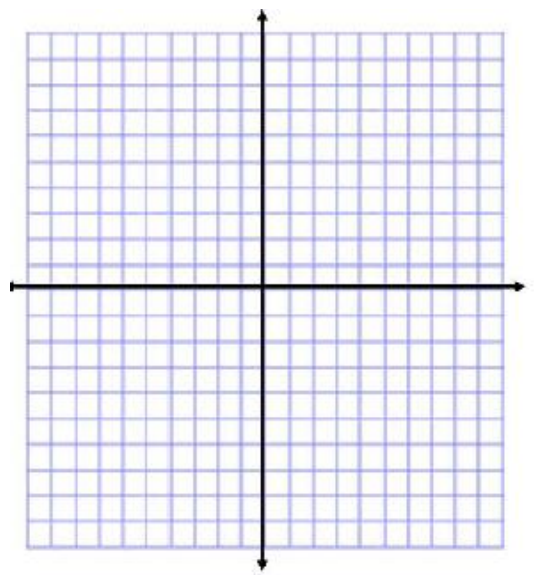
Q.16 (4 points)   Let $y = 4$ be the equation of the directrix and $(3, -8)$ be the focus of the parabola. Write the **standard equation** of the parabola.

Q.17 (5 points)   Consider the given graph.

a) Find the **standard equation** of the conic section
b) **Draw the asymptotes** on the graph and **give their equations**.

F_1 F_2
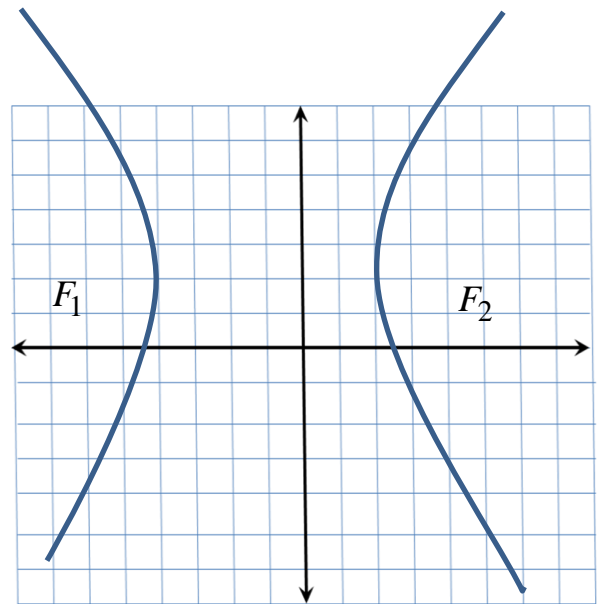
Q.18 (7 points) Graph the solution set of the system of inequalities
(Make sure to determine the **region of the solution set** and show it on **graph**)

$$\begin{cases} y \geq \log_2(x-1) \\ x > 1 \\ x + 8 \geq 2y \end{cases}$$