



Prince Sultan University Orientation Mathematics Program

MATH 002

Final Examination

Semester I, Term 121

Wednesday, January 9, 2013

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

Q.1 (4 points) Determine the **domain** and **range** for the following functions:

(i) $f(x) = \left(\frac{1}{3}\right)^{x+2} - 3$

Domain:

Range :

(ii) $f(x) = 3 - \log_5(x - 2)$

Domain:

Range :

Q.2 (12 points) Solve the following equations.

(i) $\log_2(x^2 + 2x - 3) = 2 + \log_2(x)$

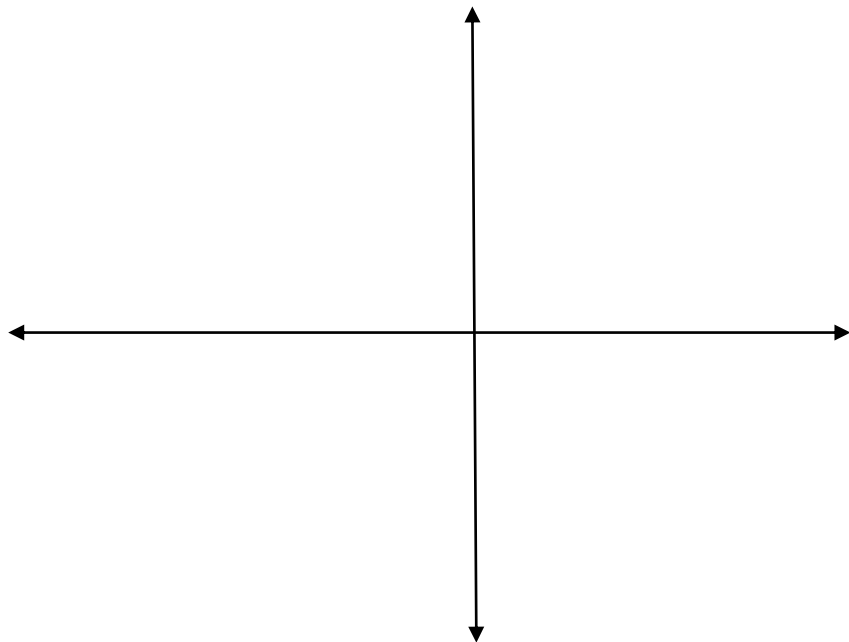
(ii) $e^{x-2} = 3^{x+1}$

Q.3 (6 points) Given that $\cos \theta = \frac{-\sqrt{7}}{3}$ and $\tan \theta > 0$

Find the value of each of the **remaining trigonometric functions**.

Q.4 (8 points) Determine the amplitude, period, and phase shift of the function, then **Graph one period**.

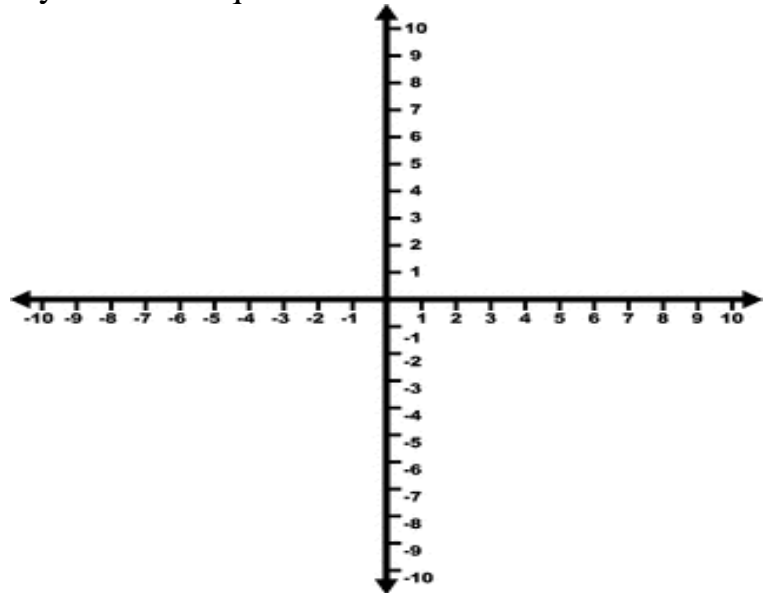
$$y = -5 \cos\left(\frac{1}{4}x + \pi\right)$$



Q.5 (4 points) Verify the identity: $\sin\left(x + \frac{\pi}{4}\right) - \cos\left(x + \frac{\pi}{4}\right) = \sqrt{2} \sin x$

Q.6 (7 points) Graph the solution set of the system of inequalities.

$$\begin{cases} (x-2)^2 - 4(y+3) \leq 0 \\ 3x + 2y < 6 \\ x \leq 2 \end{cases}$$



Q.7 (7 points) Use the equation: $36 + 25y^2 + 4x^2 + 100y = 24x$ to Find the following:

- a) The center.
- b) The vertices.
- c) The length of the minor axis.
- d) The coordinates of the foci.

Q.8 (4 points) Use a right triangle to write the following expression as an algebraic expression (in terms of x). Assume that x is positive.

$$\tan\left(\sec^{-1}\left(\frac{\sqrt{x^2+9}}{x}\right)\right)$$

Q.9 (9 points) Find the multiplicative inverse of the matrix: $A = \begin{bmatrix} 2 & -1 & -1 \\ 12 & -7 & -2 \\ -5 & 3 & 1 \end{bmatrix}$

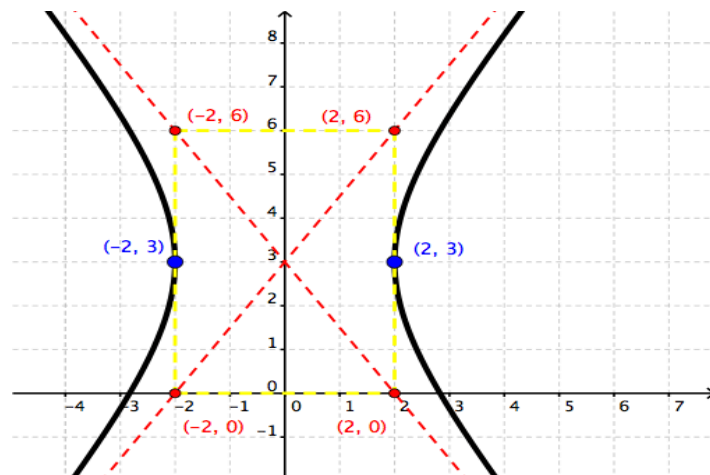
Q.10 (4 points) Solve the system of linear equations
$$\begin{cases} x - 6y + 3z = 11 \\ 2x - 7y + 3z = 14 \\ 4x - 12y + 5z = 25 \end{cases}$$

given that the inverse of $\begin{bmatrix} 1 & -6 & 3 \\ 2 & -7 & 3 \\ 4 & -12 & 5 \end{bmatrix}$ is $\begin{bmatrix} 1 & -6 & 3 \\ 2 & -7 & 3 \\ 4 & -12 & 5 \end{bmatrix}$

Q.11 (6 points) Use the given graph to answer the following questions.

(i) Identify the conic section

(ii) Write the standard form of the equation of the conic section



(iii) Give the coordinates of the foci

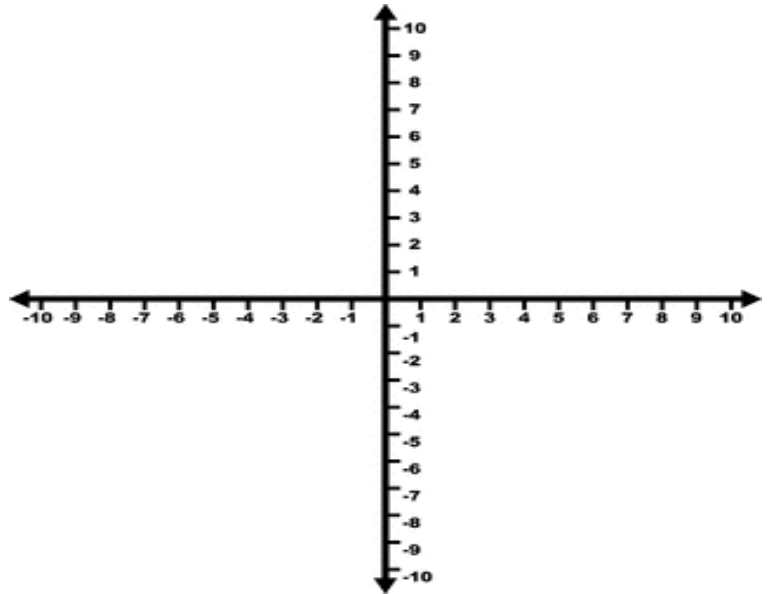
(iv) Give the equations of the asymptotes

Q.12 (4 points) Evaluate the determinant
$$\begin{vmatrix} 8 & -2 & 1 & 5 \\ 7 & 0 & 3 & -5 \\ 5 & 0 & 2 & -4 \\ 3 & 0 & 7 & 0 \end{vmatrix}$$

Q.13 (10 points) Use **Cramer's rule** to solve the system:
$$\begin{cases} x - 7 = 2y - z \\ z + 1 = y + 2x + 1 \\ 3x + 2y = 2z - 2 \end{cases}$$

Q.14 (7 points) Find the standard equation of the parabola that satisfies the following conditions:

Vertex: $(2,3)$ and directrix: $x = 4$. **Graph** the parabola.



Q.15 (8 points) Let $A = \begin{bmatrix} 0 & -2 & 6 \\ 1 & 4 & 3 \end{bmatrix}$, $B = \begin{bmatrix} 0 & 1 \\ -1 & 4 \\ -2 & 0 \end{bmatrix}$ and $C = \begin{bmatrix} 13 & 2 \\ -7 & -1 \end{bmatrix}$

a. Find $2A + 3B + 5C$

b. Find $\frac{1}{2}CA$

c. Find $CB - 5C - 9I_2$

d. Solve the matrix equation for X : $CX = -3I_2 + 2C$