College Algebra II (Math 010) Fall 2014 Final Exam
Howard University Department of Mathematics
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Name: _____

Do all of the following problems. Show all your work on the bluebook provided. No work, No credit. Good Luck!

20points 1. For the rational function $r(x) = \frac{4x^2-16}{x^2-x-6}$. Find

    (a) the domain, the x-intercept(s) and the y-intercept.

    (b) the vertical asymptotes and the horizontal or slant asymptotes.

20points 2. Given the equation $4(x+3)^2 - (y-2)^2 = 4$

    (a) Write the equation in standard form and Identify the conic section it represents.

    (b) Find the center, vertices, Foci and asymptotes of the hyperbola.

    (c) Sketch the graph labeling the vertices, foci and asymptotes.

20points 3. (a) Graph the feasible region described by the following constraints and label all the vertices:
$$0 \le x \le 4, \quad y \ge 0, \quad x+y \ge 1, \quad x+y \le 5$$

    (b) Find the maximum value of the objective function $M = 20 - 4x + 3y$ over the feasible region of part (a.)

20points 4. Given $A = \begin{bmatrix} 5 & -1 & 0 \\ 4 & 6 & 3 \end{bmatrix}$, $B = \begin{bmatrix} 2 & 4 & -6 \\ 3 & 5 & -5 \end{bmatrix}$ $C = \begin{bmatrix} 1 & -1 & 1 \\ 0 & 2 & -1 \\ 1 & 3 & 0 \end{bmatrix}$, $D = \begin{bmatrix} 4 & -1 \\ -6 & 2 \end{bmatrix}$ Find:

    (a) $A + 2B$ and $A - C$

    (b) BC and CA

    (c) Determinant of C

    (d) Inverse of D.

15points 5. The initial size of a population of bacteria that is growing exponentially is 1000 and reaches 5000 after three hours.

    (a) Find the rate of growth of the population of bacteria.

    (b) Find a function that models the population after t hours and find the population after 4.5 hours.

    (c) When will the population reach $12,000$?

6. Solve the following equations for x.

  (a) $\log(2 + x) = 7$

  (b) $\log_2 (x + 1) + \log_2(x - 1) = 3$

7. (a) Expand the expression $\ln \left(\dfrac{\sqrt[3]{x-2}}{x^4(3x - 4)} \right)$

  (b) Find the exact value of : $\log_3 16 - 2\log_3 12$

8. Solve the system of equations:

$$\begin{cases} x - y + 2z &= 0 \\ x - 2y + 3z &= -1 \\ 2x - 2y + z &= -3 \end{cases}$$

  (a) Write the augmented matrix corresponding to the system.

  (b) Solve the system, or show that it has no solution. If it has infinitely many solutions express them in terms of a single parameter (t).

9. Given the equation of the parabola as $\quad 2y^2 + 12y - 2x = 2$:

  (a) Use completing the square and write the equation in standard form.

  (b) Find the Vertex, Focus, the focal diameter and the end points of the latus rectum.

  (c) Sketch the Parabola by labeling the vertex, focus, the end point of the latus rectum and the directirx.

10. (a) For the sequence defined recursively by: $a_1 = 4, \quad a_2 = 1, \quad a_n = a_{n-1} + 2a_{n-2}$, find the sixth term of the sequence.

  (b) Find the sum $8 + 12 + 16 + 20 + \ldots + 104$

11. For the geometric sequence: $\dfrac{-2}{3}, \dfrac{1}{6}, \dfrac{-1}{24}, \ldots$

  (a) Find the common ratio r for the sequence.

  (b) Find the the value of the 20th term of the sequence.

  (c) Find the sum of the infinite series : $\dfrac{-2}{3} + \dfrac{1}{6} - \dfrac{1}{24} + \dfrac{1}{96} + \ldots$ if it is convergent, otherwise write Divergent.

12. Use Cramer's rule or Inverse Method ONLY to solve $\begin{cases} 4x + 2y &= 11 \\ 3x - y &= 2 \end{cases}$

13. (a) Find the time required for an investment of $1000 to grow to $6000 at an interest rate of 8% compounded quarterly.

  (b) A sum of $1000 was invested for 3 years and interest is compound continuously. If the amount grows to $3200 in the given time, what was the rate of interest?

14. (a) Find the inverse of the function $f(x) = \dfrac{2x + 3}{x + 3}$

  (b) Find the domain and range of the inverse function.