This exam is closed book. No graphing calculators are allowed. No bathroom breaks are permitted while taking the exam. No cell phones are permitted. There are 15 questions, each is weighted equally. Good luck!

1) Conver to an exponential equation: $\log_9 27 = \dfrac{3}{2}$

1) _____

   A) $27 = \left(\dfrac{3}{2}\right)^9$ 　　　　B) $9 = 27^{3/2}$ 　　　　C) $27 = 9^{3/2}$ 　　　　D) $\dfrac{3}{2} = \sqrt[9]{27}$

2) Find the inverse, if it exists, of the given matrix: $\begin{bmatrix} 5 & 1 \\ 24 & 5 \end{bmatrix}$

2) _____

   A) $\begin{bmatrix} -5 & 24 \\ 1 & -5 \end{bmatrix}$ 　　B) $\begin{bmatrix} -5 & -1 \\ -24 & -5 \end{bmatrix}$ 　　C) $\begin{bmatrix} 5 & -1 \\ -24 & 5 \end{bmatrix}$ 　　D) $\begin{bmatrix} 5 & 24 \\ 1 & 5 \end{bmatrix}$

3) Find the equation of any horizontal asymptote: $f(x) = \dfrac{9x^2 - 7x - 5}{5x^2 - 9x + 8}$
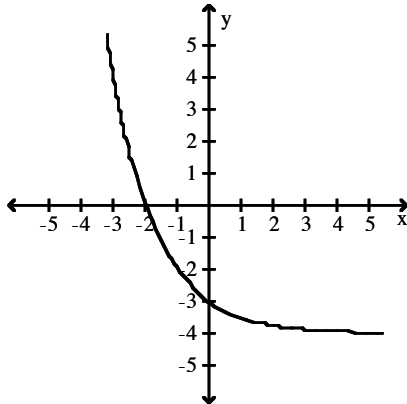
3) _____

   A) $y = \dfrac{7}{9}$ 　　　　B) $y = \dfrac{9}{5}$ 　　　　C) $y = 0$ 　　　　D) None

4) Write a system of equations associated with the augmented matrix below. Do not try to solve.
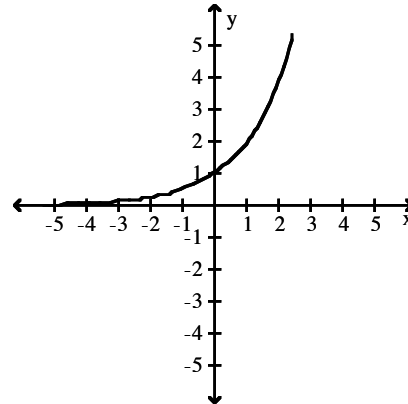
4) _____

$\begin{bmatrix} 3 & 3 & 5 & | & -2 \\ 5 & 0 & 7 & | & 4 \\ 3 & 6 & 0 & | & 2 \end{bmatrix}$

A) $3x_1 - 3x_2 + 5x_3 = -2$
$\quad 5x_1 \qquad + 7x_3 = 4$
$\quad 3x_1 + 6x_2 \qquad = 2$

B) $3x_1 + 3x_2 + 5x_3 = -2$
$\quad 5x_1 \qquad + 7x_3 = 4$
$\quad 3x_1 + 6x_2 \qquad = 2$

C) $3x_1 + 3x_2 + 5x_3 = 2$
$\quad 5x_1 \qquad + 7x_3 = 4$
$\quad 3x_1 + 6x_2 \qquad = 2$

D) $3x_1 + 3x_2 + 5x_3 = -2$
$\quad 5x_1 \qquad + 7x_3 = -4$
$\quad 3x_1 + 6x_2 \qquad = -2$
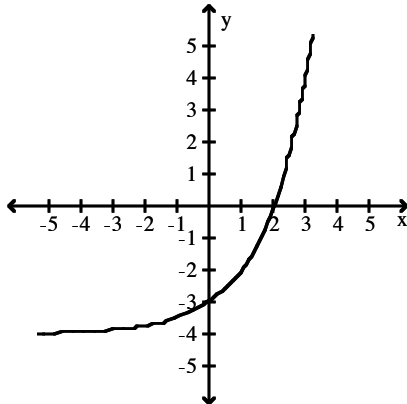
5) Graph the function: $f(x) = 2^{-x} - 4$ 5) _____
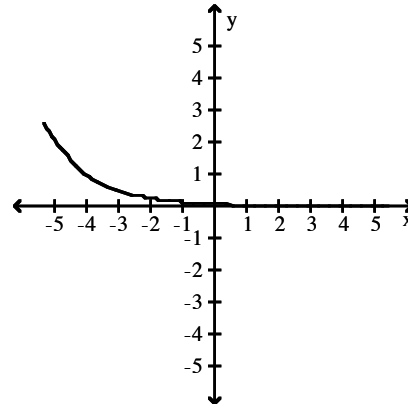
A)

B)

C)

D)

6) A country has a population growth rate of 2.4% compounded continuously. At this rate, how   6) _____
   long will it take for the population of the country to double? Round your answer to the nearest
   tenth.
   A) .29 years   B) 28.9 years   C) 2.9 years   D) 30 years

7) Solve the system as matrix equations using inverses: $-5x_1 + 3x_2 = 8$ 7) _____
                                                             $3x_1 - 6x_2 = -30$

   A) (–6, –2)   B) (2, 6)   C) (6, 2)   D) (–2, –6)

8) The matrix is the final matrix form for a system of two linear equations in variables x_1 and x_2.   8) _____

   Write the Solution of the system: $\begin{bmatrix} 1 & -4 & | & 10 \\ 0 & 0 & | & 0 \end{bmatrix}$

   A) $x_1 = 4t + 10$ B) No solution
      $x_2 = t$ for any real number t
   C) $x_1 = t - 4$ D) $x_1 = t$ for any real number t
      $x_2 = t$ for any real number t $x_2 = 10$

9) Perform the operation, if possible: Let $A = \begin{bmatrix} -1 & 5 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} -6 & -2 & 9 \\ -5 & -7 & -3 \\ 6 & -8 & 2 \end{bmatrix}$. Find AB.   9) _____

    A) $\begin{bmatrix} -13 & -41 & -22 \end{bmatrix}$ B) $\begin{bmatrix} 6 & -10 & 9 \\ 5 & -35 & -3 \\ -6 & -40 & 2 \end{bmatrix}$

    C) $\begin{bmatrix} 13 & 41 & 22 \end{bmatrix}$ D) $\begin{bmatrix} -13 \\ -41 \\ -22 \end{bmatrix}$

10) Find the equations of any vertical asymptotes: $f(x) = \dfrac{x^2 + 5x}{x^2 - 4x - 45}$ 10) _____

    A) $x = 9, x = -5$ B) $x = -9, x = 5$ C) $x = 9$ D) None

11) An initial investment of $12,000 is invested for 2 years in an account that earns 4% interest,   11) _____
    compounded quarterly. Find the amount of money in the account at the end of the period.
    A) $12,994.28   B) $12,865.62   C) $12,979.20   D) $994.28

12) What is the maximum number of x intercepts that a polynomial of degree 12 can have?   12) _____
    A) 11   B) 12
    C) 13   D) Not enough information is given.

13) Use the properties of logarithms to solve: $\ln(3x - 4) = \ln 20 - \ln(x - 5)$ 13) _____

    A) $5, \dfrac{5}{3}$ B) $0, \dfrac{19}{3}$ C) $-5, -\dfrac{19}{3}$ D) $\dfrac{19}{3}$

14) Solve for t: $e^{-0.07t} = 0.05$ Round your answer to four decimal places.   14) _____
    A) −70.1312   B) 44.321   C) 42.7962   D) −66.4815

15) Which of the following matrices has an inverse?   15) _____

    A) $\begin{bmatrix} 3 & -2 & 1 \\ 4 & 0 & 7 \end{bmatrix}$ B) $\begin{bmatrix} 0 & 4 \\ 0 & -2 \end{bmatrix}$ C) $\begin{bmatrix} -2 & 3 \\ 4 & 1 \end{bmatrix}$ D) $\begin{bmatrix} 0 & -1 \\ 3 & 5 \\ -1 & 3 \end{bmatrix}$

1) C
2) C
3) B
4) B
5) A
6) B
7) B
8) A
9) A
10) C
11) A
12) B
13) D
14) C
15) C