Meramec College Algebra TEST 3 Fall 2009

NAME:_____Score_____/100

Please print **Average for in-class tests and quizzes** _____

SHOW ALL YOUR WORK IN A NEAT AND ORGANIZED FASHION. NO WORK – NO CREDIT

Circle T or F, whichever is correct. (1 pts each)

1. T F The functions exp and ln are inverses.
2. T F Every square matrix has a multiplicative inverse.
3. T F The graph of a 5^{th} degree polynomial function has at least one x-intercept.
4. T F Every rational function has a horizontal asymptote.
5. T F For each exponential function, the y-intercept is (0,1).

In the following multiple choice questions, any number of choices may be correct. In each question at least one choice is correct. Circle ALL correct choices. (1 pt. for each choice.)

6. Consider the function whose rule is $f(x) = \frac{x+1}{x-3}$.
   a. The zeros of f are -1 and 3.
   b. The x-intercept of the graph of f is (-3,0).
   c. The x-intercept of the graph of f is (-1,0).
   d. The x-intercept of the graph of f is (3, 0).
   e. The x-axis is a horizontal asymptote of f.
   f. The line y = 1 is a horizontal asymptote of f.
   g. There is no horizontal asymptote for f.
   h. The line x = 3 is a vertical asymptote.
   i. The line x = -3 is a vertical asymptote.
   j. The domain of f is all real numbers.
   k. The domain of f is all real numbers except 3 and -1.
   l. The domain of f is all real numbers except 3.

7. Consider the exponential function exp base e.
   a. The x-intercept of exp is (1,0).
   b. The y-intercept of exp is (0,1).
   c. The function exp has no x-intercept.
   d. The function exp has no y-intercept.
   e. The exp function satisfies the vertical line test.
   f. The exp function satisfies the horizontal line test.
   g. The exp function has an inverse.
   h. The exp function has a vertical asymptote.

8. Suppose f is a polynomial function f whose leading term is $-3x^5$ and whose constant term is 5.
   a. The graph of f tries to cross the x-axis 5 times.
   b. The graph of f has at least one x-intercept.
   c. The graph of f might have no x-intercepts.
   d. $\text{As } x \to +\infty,\ f(x) \to +\infty$.
   e. $\text{As } x \to -\infty,\ f(x) \to +\infty$.
   f. $\text{As } x \to +\infty,\ f(x) \to -\infty$.
   g. $\text{As } x \to -\infty,\ f(x) \to -\infty$
   h. The graph of f might have a horizontal asymptote.
   i. The graph of f might have a vertical asymptote.
   j. A possible rational zero of f is $\frac{3}{5}$.
   k. A possible rational zero of f is $\frac{5}{3}$.

(2 pts each for 9 – 15)

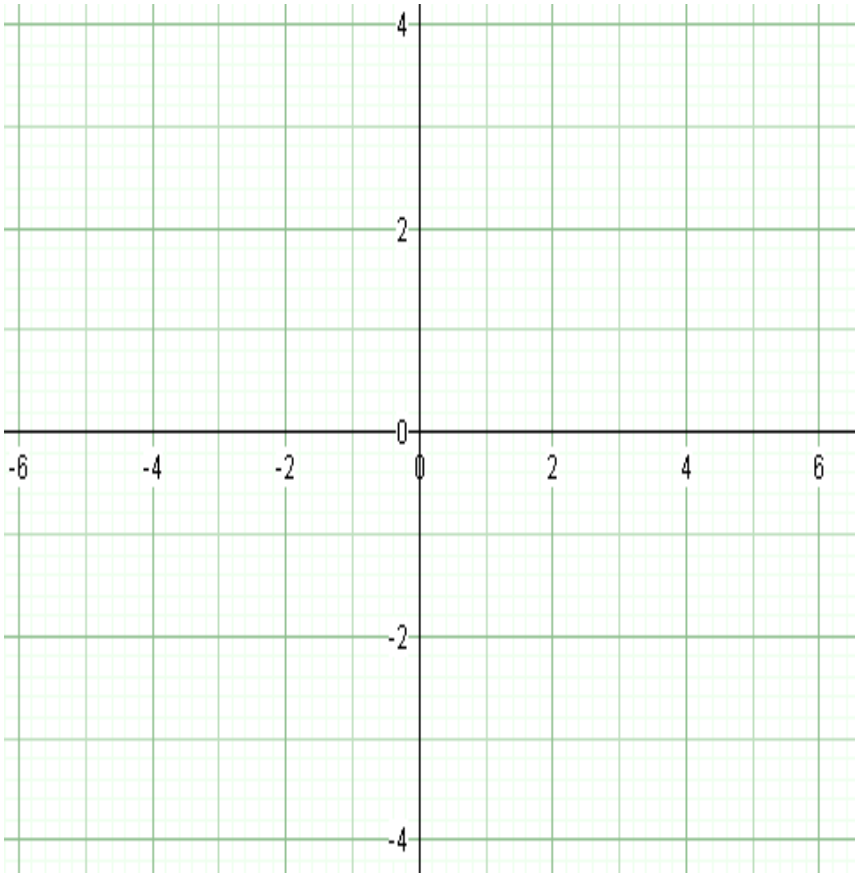
9. The boundary equation for $3x^2 - 2x^3 < 7$ is _____.
10. A _____ is a rectangular array of numbers.
11. The determinant is a _____ whose domain is the set of _____ _____ and whose range is the _____ _____.
12. Two systems of equations are _____ systems if they have the same solution sets.
13. The exponential function base e is the function exp whose rule may be written in the form exp(x) = _____ .
14. The logarithm function base e is the function which is the _____ of the function exp.
15. Two matricies are equal if they have the same _____ and their corresponding _____ are equal.

16. **(5 pts)** Use the substitution method to solve the system of equations

$$\begin{cases} 2x + 3y = 9 \\ x - 4y = -1 \end{cases}$$

17. **(5 pts.)** Compute the determinant $\det\left(\begin{bmatrix} 2 & -3 \\ 5 & 4 \end{bmatrix}\right)$

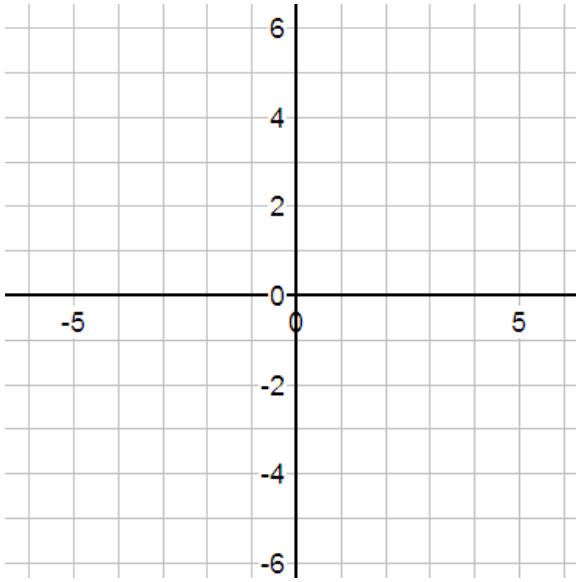
18. **(5 pts.)** Sketch the graph of $f(x)=\dfrac{3(x-2)(x+1)}{8(x-3)(x+2)}$.



Organize your facts here:

Kind of function:	Domain:
x-intercepts are:	Horizontal asymptotes:
y-intercept is:	Vertical asymptotes:
test	test
test	test
test	

19. **(5 pts.)** Sketch the graph of the system $\begin{cases} x - y < 1 \\ 2x + 3y \geq 12 \end{cases}$



20. **(5 pts.)** Perform the multiplication:

$$\begin{bmatrix} 1 & 2 & -4 \\ -2 & -3 & 3 \end{bmatrix} \begin{bmatrix} 2 & -2 \\ 3 & 1 \\ -1 & 2 \end{bmatrix} = \begin{bmatrix} \square & \square \\ \square & \square \end{bmatrix}$$

21. **(5 pts.)** What are the possible rational zeros of $f(x) = 4x^5 + 8x^3 + 4x - 3$.

$p \in \{ \quad \}$

$q \in \{ \quad \}$

$\frac{p}{q} \in \{ \quad \}$

22. **(5 pts.)** Supply the missing entries by performing the indicated elementary row operation. $\begin{bmatrix} 2 & 1 & \frac{1}{5} & 0 \\ -4 & -3 & 0 & 1 \end{bmatrix} \xrightarrow{2R_1+R_2 \longrightarrow R_2} \begin{bmatrix} \boxed{2} & \boxed{1} & \boxed{\frac{1}{5}} & \boxed{0} \\ \square & \square & \square & \square \end{bmatrix}$

23. **(5 pts.)** Consider the matrices. A = $\begin{bmatrix} 1 & 2 & 2 \\ 3 & 7 & 9 \\ -1 & -4 & -7 \end{bmatrix}$ X = $\begin{bmatrix} x \\ y \\ z \end{bmatrix}$ C = $\begin{bmatrix} -1 \\ 2 \\ 1 \end{bmatrix}$ and $A^{-1} = \begin{bmatrix} -13 & 6 & 4 \\ 12 & -5 & -3 \\ -5 & 2 & 1 \end{bmatrix}$

Solve the matrix equation AX = C.

24. **(5 pts.)** Solve the equation $e^{5x-3} = 2$

25.

(5 points) You do not need to do any computations. Simply fill in the blanks to describe the process for finding the inverse of a matrix.

To find the inverse of the matrix A = $\begin{bmatrix} 5 & 7 & 4 \\ 3 & -1 & 3 \\ 6 & 7 & 5 \end{bmatrix}$

Begin by adjoining the _____ matrix to obtain the matrix $\begin{bmatrix} 5 & 7 & 4 & 1 & 0 & 0 \\ 3 & -1 & 3 & 0 & 1 & 0 \\ 6 & 7 & 5 & 0 & 0 & 1 \end{bmatrix}$

with order _____

The next step is to get a _____ in the _____ position.

Then use that _____ to get _____ everywhere else in the

_____

At this point the matrix will have been converted to $\begin{bmatrix} 1 & 7/5 & 4/5 & 1/5 & 0 & 0 \\ 0 & -26/5 & 3/5 & -3/5 & 1 & 0 \\ 0 & -7/5 & 1/5 & -6/5 & 0 & 1 \end{bmatrix}$

The next step is to get a _____ in the _____ position.

Then use that _____ to get _____ everywhere else in the

_____

At this point the matrix will have been converted to $\begin{bmatrix} 1 & 0 & 25/26 & 1/26 & 7/26 & 0 \\ 0 & 1 & -3/26 & 3/26 & -5/26 & 0 \\ 0 & 0 & 1/26 & -27/26 & -7/26 & 1 \end{bmatrix}$

The next step is to get a _____ in the _____ position.

Then use that _____ to get _____ everywhere else in the

_____

At this point the matrix will have been converted to $\begin{bmatrix} 1 & 0 & 0 & 26 & 7 & -25 \\ 0 & 1 & 0 & -3 & -1 & 3 \\ 0 & 0 & 1 & -27 & -7 & 26 \end{bmatrix}$

The inverse of A is the matrix A^{-1} =

Which has order _____