Meramec College Algebra TEST 4 Math 160C Solution Spring 2013

NAME: _____Score_____/100

Please print

SHOW ALL YOUR WORK IN A NEAT AND ORGANIZED FASHION Course Average_____

No Decimals No mixed numbers No complex fractions No boxed or circled answers

Questions 1 – 31 are 1 pts each. All others are 4 pts each.

1. **T** F The functions exp and ln are inverses.
2. **T** F There are infinitely many exponential functions.
3. **T** F Each logarithmic function has a vertical asymptote.
4. **T** F Two systems of equations with the same solution sets are equivalent systems.
5. T **F** The solutions for a system of two equations in two variables are the x-intercepts of the equations.
6. **T** F The ln function has an inverse.
7. T **F** The base for the exp function is 10.
8. T **F** The graph of ln is entirely above the x-axis.
9. **T** F The graph of exp is entirely above the x-axis.
10. **T** F $e^x e^y = e^{x+y}$
11. T **F** $e^x + e^y = e^{x+y}$
12. T **F** $e^x e^y = e^{xy}$
13. T **F** $\ln(x+y) = \ln(x) + \ln(y)$
14. **T** F Each exponential function has an inverse.
15. **T** F Each exponential function has a horizontal asymptote.
16. **T** F Every system of equations in two variables has a solution set.
17. **T** F The solution set for a system of linear inequalities in two variables is the intersection of the solution sets of each individual inequality.
18. **T** F The collection of all solutions of a system of equations is called the solution set of the system of equations.
19. **T** F $\ln(xy) = \ln(x) + \ln(y)$
20. Consider the exponential function exp base e.
    - T **F** The x-intercept of exp is (1,0).
    - **T** F The y-intercept of exp is (0,1).
    - **T** F The function exp has no x-intercept.
    - T **F** The function exp has no y-intercept.
    - **T** F The exp function satisfies the vertical line test.
    - **T** F The exp function satisfies the horizontal line test.
    - **T** F The exp function has an inverse.
    - T **F** The exp function has a vertical asymptote.
    - **T** F ln is the inverse of exp.
    - T **F** log is the inverse of exp.

21. In a system of linear equations, replacement of an equation with an **equivalent** equation produces a system which is equivalent to the original system. .

22. Two systems of equations are **equivalent** systems if they have the same solution sets.

23. The exponential function base e is the function exp whose rule may be written in the form exp(x) = $\mathbf{e^x}$.

24. The logarithm function base e is the function which is the **inverse** of the function exp.

25. In a system of linear equations, if the value of one of the variables is known, an **equivalent** system is generated if that value is substituted into the equations.

26. The domain of exp is **the set of all real numbers R**

27. The domain of ln is **the set of all positive real numbers**

28. If the rule for a function f is $f(x) = 3^{x-5}$, then f(8) = $\mathbf{3^3 = 27}$

29. What is the rule for the $\exp_2$ function? $\exp_2(x) = 2^x$

30. A system S of equations consists of two linear equations in two variables. If the linear equations have different slopes, how many solutions does the system S have? **One**

31. The vertical asymptote of ln(x – 5) is **x=5**

32. Solve the equation ln(2x – 5) = 7

$$\exp\circ \ln(2x-5) = \exp(7)$$
$$2x-5 = \exp(7) = e^7$$
$$x = \frac{5+e^7}{2}$$

33. Solve the equation $e^{3x+2} = 8$

$$\ln\circ \exp(3x+2) = \ln(8)$$
$$3x+2 = \ln(8)$$
$$x = \frac{\ln(8)-2}{3}$$

34. What is the domain of the function whose rule is f(x) = ln(x + 5)?

$$D_f = (-5, +\infty)$$

35. The line x + y = 1 intersects the circle $(x + 2)^2 + (y - 3)^2 = 8$ in the two points (0, 1) and (–4, 5). Use that information to determine the solution set for the system $\begin{cases} (x+2)^2 + (y-3)^2 = 8 \\ x + y = 1 \\ x - 3y = -19 \end{cases}$

Because this is a system of equations in two variables, it solution set will be the set of ordered pairs of real numbers which are coordinates of points on all three graphs.

Because there are only two points which are on the graphs of both the first two equations, the solution set of the system must be a subset of {(0, 1), (–4, 5)}.

To determine the solution set for the system we must determine which of the two points (0, 1), (–4, 5) are on the graph of the third equation.

Test (0, 1): 0 – 3(1) = – 19 is false. Therefore (0, 1) is not in the solution set.

Test (–4, 5): –4 – 3(5) = – 19 is true. Therefore (– 4, 5) is in the solution set.

The solution set for the system is {(–4, 5)}.

36. Solve the equation $3e^{5x} = 1977$.

$e^{5x} = \frac{1977}{3} = 659$

$\ln \circ \exp(5x) = \ln(659)$

$5x = \ln(659)$

$x = \frac{\ln(659)}{5}$

37. Solve the equation $\log_2(4x + 1) = 5$

$\exp_2 \circ \log_2(4x + 1) = \exp_2(5) = 2^5 = 32$

$4x + 1 = 32$

$x = \frac{31}{4}$

38. Use the substitution method to solve the system

$$\begin{cases} 2x-3y=-2 \\ 4x+y=24 \end{cases} \longrightarrow \begin{cases} 2x-3y=-2 \\ y=24-4x \end{cases}$$

$$\longrightarrow \begin{cases} 2x-3(24-4x)=-2 \\ y=24-4x \end{cases} \longrightarrow \begin{cases} 14x=70 \\ y=24-4x \end{cases} \longrightarrow \begin{cases} x=5 \\ y=24-4x \end{cases}$$

$$\longrightarrow \begin{cases} x=5 \\ y=24-4(5) \end{cases} \longrightarrow \begin{cases} x=5 \\ y=4 \end{cases}$$

The solution set is $\{(5,4)\}$

39. Write $\log_5(18)$ using the ln function.

$$\log_5(18)=\frac{\ln(18)}{\ln(5)}$$

40. Solve the equation $\ln(3x-2)=1$

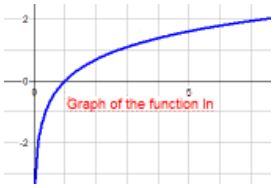
$$\exp\circ\ln(3x-2)=\exp(1)=e$$

$$3x-2=e$$

$$x=\frac{2+e}{3}$$

41. Sketch the graph of exp.

42. Sketch the graph of ln



43. Write $e^3 = y$ in logarithmic form

$\ln \circ \exp(3) = \ln(y)$

$3 = \ln(y)$

44. Write $x = \ln(4k + 1)$ in exponential form

$\exp(x) = \exp \circ \ln(4k+1)$

$e^x = 4k+1$

45. Write $3\log(x + 4) - \log(x - 1)$ as a single logarithm.

$3\log(x+4) - \log(x-1)$

$= \log\left[(x+4)^3\right] - \log(x-1)$

$= \log\left[\frac{(x+4)^3}{x-1}\right]$

46. Solve the equation $2\log(x) - \log(2) = \log(18)$

$2\log(x) - \log(2) = \log(18)$

$\log\left(x^2\right) = \log(18) + \log(2)$

$\log\left(x^2\right) = \log(36)$

$\exp_{10} \circ \log\left(x^2\right) = \exp_{10} \circ \log\left(36\right)$

$x^2 = 36$

$x = \pm 6$

Because the domain of $\log(x)$ is the positive real numbers

- 6 cannot be a solution.

The solution set is $\{6\}$