

NAME: _____ Score _____ /100

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SHOW ALL YOUR WORK IN A NEAT AND ORGANIZED FASHION

Course Average _____

Questions 1-20 are 2 pts each, 21 – 32 are 5 pts each.

1. **T** F The ln function has an inverse
2. **T** F The \log_7 and log functions have the same x-intercepts.
3. T **F** The base for the exp function is 10
4. T **F** $\log_2 \circ \exp(3x + 7) = 3x + 7$
5. T **F** The graph of ln is entirely above the x-axis.
6. **T** F The graph of exp is entirely above the x-axis.
7. **T** F Two systems of equations with the same solution sets are equivalent systems.
8. T **F** The solutions for a system of two equations in two variables are the x-intercepts of the equations.
9. T **F** $\ln(x+y) = \ln(x) + \ln(y)$
10. T **F** If t is a real number, then $\ln(t)$ is a positive real number.

Fill in the blanks

11. The zero of the ln function is **1**
12. The y-intercept of log is **There is none**
13. The domain of \exp_5 is **the real numbers**
14. The domain of ln is **the positive real numbers**
15. The rule for the exponential function base 17 is **$\exp_{17}(x)=17^x$**
16. If the rule for a function f is $f(x) = 3^{x-5}$, then $f(8) = 3^{8-5}=3^3=27$
17. What is the rule for the \log_2 function? **There is none**
18. 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**
19. A system W of equations consists of two linear equations in two variables x and y. If replacing x with 2 and replacing y with -7 makes both equations in the system true then the solution for the system is **(2, -7)**
20. To find the point or points where the line $x - y = 2$ intersects the circle $x^2 + y^2 = 16$ it is necessary to solve the system of equations $\begin{cases} x - y = 2 \\ x^2 + y^2 = 16 \end{cases}$

For the remaining problems you must show your work to receive credit.

21. Solve the equation $3e^x = 10$

$$3e^x = 10$$

$$e^x = \frac{10}{3}$$

$$\ln \circ \exp(x) = \ln\left(\frac{10}{3}\right)$$

$$x = \ln\left(\frac{10}{3}\right)$$

22. Solve the equation $e^x x^2 - e^x x - 2e^x = 0$ and complete the conclusion below.

$$e^x x^2 - e^x x - 2e^x = 0$$

$$e^x(x^2 - x - 2) = 0$$

$$e^x(x - 2)(x + 1) = 0$$

$$e^x = 0 \text{ or } x - 2 = 0 \text{ or } x + 1 = 0$$

$$e^x = 0 \text{ or } x = 2 \text{ or } x = -1$$

e^x has no solution, so its solution set is the null set \emptyset , the solutions set for $x = 2$ is $\{2\}$, and the solution set for $x = -1$ is $\{-1\}$. The solution set for the original equation is therefore $\emptyset \cup \{2\} \cup \{-1\} = \{2, -1\}$.

The solution set is $\{2, -1\}$

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

$$\ln(3x - 2) = 1$$

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

$$3x - 2 = e$$

$$3x = e + 2$$

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

24. Evaluate the expression $\log_5(125)$

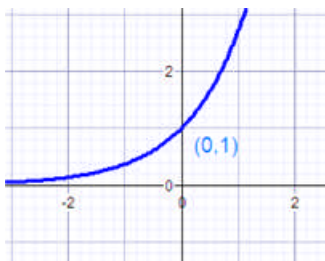
$$y = \log_5(125)$$

$$\exp_5(y) = \exp_5 \circ \log_5(125)$$

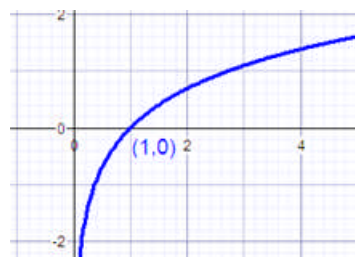
$$5^y = 125$$

$$y = 3$$

25. Sketch the graph of exp.



26. Sketch the graph of log



27. Write $\ln(5) = x$ in exponential form

$$\ln(5) = x$$

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

$$5 = e^x$$

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

$$e^3 = y$$

$$\exp(3) = y$$

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

$$3 = \ln(y)$$

29. Use the substitution method to solve the system
$$\begin{cases} -x + y = 2 \\ 4x - 3y = -3 \end{cases}$$

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

The solution for the system is the ordered pair (3,5).

30. Use the substitution method to solve the system
$$\begin{cases} x + 2y + z = 7 \\ -y + 3z = 9 \\ 2z = 6 \end{cases}$$

$$\begin{cases} x + 2y + z = 7 \\ -y + 3z = 9 \\ 2z = 6 \end{cases} \longrightarrow \begin{cases} x + 2y + z = 7 \\ -y + 3z = 9 \\ z = 3 \end{cases} \longrightarrow \begin{cases} x + 2y + 3 = 7 \\ -y + 9 = 9 \\ z = 3 \end{cases} \longrightarrow \begin{cases} x + 2y = 4 \\ y = 0 \\ z = 3 \end{cases} \longrightarrow \begin{cases} x = 4 \\ y = 0 \\ z = 3 \end{cases}$$

The solution for the system is the ordered triple (4, 0, 3)

31. Use the substitution method to solve the system
$$\begin{cases} x + y = 4 \\ -x + y = 0 \end{cases}$$
 and complete the conclusion below.

$$\begin{cases} x + y = 4 \\ -x + y = 0 \end{cases} \longrightarrow \begin{cases} x + y = 4 \\ x = y \end{cases} \longrightarrow \begin{cases} y + y = 4 \\ x = y \end{cases} \longrightarrow \begin{cases} 2y = 4 \\ x = y \end{cases} \longrightarrow \begin{cases} y = 2 \\ x = y \end{cases} \longrightarrow \begin{cases} y = 2 \\ x = 2 \end{cases}$$

The solution for the system is the ordered pair (2,2)

32. Solve the equation $\log_2(x) + \log_2(x + 1) = 1$

$$\log_2(x) + \log_2(x + 1) = 1$$

$$\log_2[x(x + 1)] = 1$$

$$\log_2(x^2 + x) = 1$$

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

$$x^2 + x = 2$$

$$x^2 + x - 2 = 0$$

$$(x + 2)(x - 1) = 0$$

$$x + 2 = 0 \text{ or } x - 1 = 0$$

$$x = -2 \text{ or } x = 1$$

The possible solutions are -2 and 1

If $x = -2$, then $\log_2(x) = \log_2(-2)$ is not defined because -2 is not in the domain of \log_2 .

Therefore -2 is not a solution of the original equation.

On the other hand if $x = 1$, then both $\log_2(x)$ and $\log_2(x + 1)$ are defined.

Therefore 1 is a solution of the original equation and the solution set is {1}.