

Warm-Up:

1) Solve: $3^x = 729$

6

2) Solve: $3^{4x} = 35$

$x = .8075$

3) Solve: $\log(2x + 2) = 6$

$x = 49,999$

4) Solve: $\log_3 6x = 2$

1.5

ACT Question of the Day

23. Which of the following expressions is equivalent to

$\frac{1}{2}y^2(6x + 2y + 12x - 2y)$?

A. $9xy^2$

B. $18xy$

C. $3xy^2 + 12x$

D. $9xy^2 - 2y^3$

E. $3xy^2 + 12x - y^3 - 2y$

$\frac{1}{2} y \frac{18x}{2}$

$9xy^2$

NC Final Exam Question of the Day!!!

5 A function is shown below.

$$f(x) = \begin{cases} -x^2 + 2x & \text{for } x \leq -3 \\ 2\left(\frac{1}{3}\right)^{2x} & \text{for } -3 < x < 4 \\ \frac{2x - 5}{x - 7} & \text{for } x \geq 4 \end{cases}$$

What is the value of the expression $f(-3) + 2f(-1) - f(4)$?

A. $\frac{101}{36}$

B. $\frac{32}{9}$

C. 4

D. 22

$x = -3$
①

$x = -1$
②

$x = 4$
③

$-9 - 6 + 36 = \frac{3}{-3}$

$-9 + -6 + 36 + 1$

$= 22$

Kahoot



https://create.kahoot.it/?_ga=1.2325104.1591058973.1440431371&deviceId=5723271c-9694-4765-9b82-3e06dc93827b#quiz/27dbce9b-ef2f-4b87-b635-8267919eb212

Unit 6 ~ Logarithms & Exponentials

Day 5: Natural Logarithms

The function $y = e^x$ has an inverse, the natural logarithmic function, $y = \ln x$

$$y = \ln x$$

Evaluate without using a calculator.

1) $\ln e^x = x$

2) $\ln e^3 = 3$

3) $\ln e = 1$

4) $\ln \frac{1}{e} = \ln e^{-1} = -1$

Example 1: Simplifying a Natural Logarithmic Expression

a) $3 \ln 2 - 3 \ln x = \ln(2^3) - \ln x^3 = \ln \frac{8}{x^3}$

b) $2 \ln 3 + \ln 8 = \ln(3^2) + \ln(8) = \ln(9 \cdot 8) = \ln(72)$

c) $20 \ln x + 5 \ln y + 2 \ln z = \ln x^{20} + \ln y^5 + \ln z^2 = \ln x^{20} y^5 z^2$

***Same rules as logarithms!!!!**

Example 2: Solving a Natural Logarithmic Equation

Solve for x.

e^x has an inverse $\ln x$

a) $\ln x = 5$
 $e^{\ln x} = e^5$
 $x = e^5 \leftarrow$ put in calc
 $x = 148.41$

b) $2 \ln(6x + 1) = 6$
 $\ln(6x + 1) = 3$
 $e^{\ln(6x + 1)} = e^3$

$6x + 1 = 20.09$
 $\frac{6x}{6} = \frac{19.09}{6}$
 $x = 3.18$

c) $2 \ln x + \ln 4 = 5$
 $\ln x^2 + \ln 4 = 5$
 $\ln 4x^2 = 5$

$e^{\ln 4x^2} = e^5$
 $4x^2 = 148.41$
 $\frac{4x^2}{4} = \frac{148.41}{4}$
 $x^2 = 37.10$
 $\sqrt{x^2} = \sqrt{37.10}$
 $x = 6.09$

Example 3: Solving an Exponential Equation

Solve for x.

a) $e^{x+3} = 24$
 $\ln(e^{x+3}) = \ln 24$
 $x + 3 = 3.17$
 $\frac{-3}{-3} = \frac{-3}{-3}$
 $x = .17$

b) $5e^{-3x} = 45$
 $\frac{5e^{-3x}}{5} = \frac{45}{5}$
 $e^{-3x} = 9$
 $\ln(e^{-3x}) = \ln(9)$
 $\frac{-3x}{-3} = \frac{2.2}{-3}$
 $x = -.73$

c) $2e^{5x} - 8 = 30$
 $\frac{2e^{5x} + 8}{2} = \frac{38}{2}$
 $e^{5x} = 19$
 $\ln(e^{5x}) = \ln 19$
 $\frac{5x}{5} = \frac{2.94}{5}$
 $x = .59$

Your Turn: Solve for x.

1) $\ln x = 2$

$$x = 7.38$$

2) $e^{x-2} = 12$

$$\begin{aligned} \ln e^{x-2} &= \ln 12 \\ x-2 &= 2.48 \\ x &= 4.48 \end{aligned}$$

3) $2 \ln(3x + 5) = 8$

$$x = 1.5$$

4) $\frac{2e^{-x}}{2} = \frac{20}{2}$

$$x = -2.3$$

Example 4: Inverse

a) Find the inverse of $y = e^{2x+1}$?

$$\begin{aligned} x &= e^{2y+1} \\ \ln(x) &= \ln e^{2y+1} & y &= \frac{\ln(x)-1}{2} \\ \ln(x) &= 2y+1 \\ \frac{\ln(x)-1}{2} &= y \end{aligned}$$

b) Find the inverse of $y = \ln(x+2)$.

$$\begin{aligned} x &= \ln(y+2) \\ e^x &= e^{\ln(y+2)} & y+2 &= e^x \\ & & y &= e^x - 2 \end{aligned}$$