Lesson 7.6 Natural Logs (Clickers)

Essential Understanding: The functions $y = e^x$ and $y = \ln x$ are inverse functions. Just as before, this means that if $a = e^b$, then $b = \ln a$, and vice versa.

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

Ex. What is 2 ln 15 - ln 75 written as a single natural logarithm?

1 What is the expression written as a single natural logarithm?

$\ln 7 + 2\ln 5$

2 What is the expression written as a single natural logarithm?

$3\ln x + 2\ln y + \ln 5$

*You can use the inverse relationship between the functions $y = \ln x$ and $y = e^x$ to solve certain logarithmic and exponential equations.

Ex. What are the solutions of $\ln(x - 3)^2 = 4$?

Ex. What are the solution(s) of $\ln(3x + 5)^2 = 4$?

3 What is the solution of $\ln x = 2$? (Round to the nearest hundredth.)

4 What is the solution of $\ln 2x + \ln 3 = 2$? (Round to the nearest hundredth)

Ex. What is the solution of $4e^{2x} + 2 = 16$?

Ex. What is the solution of $e^{x-2} = 12$?

5 What is the solution of $e^{3x} + 5 = 15$? (Round to the nearest hundredth)

Natural logarithms are useful because they help express many relationships in the physical world.

Ex. A spacecraft can attain a stable obit 300 km above Earth if it reaches a velocity of 7.7 km/s. The formula for a rocket's maximum velocity v in kilometers per second is $v = -0.0098t + c \ln R$. The booster rocket fires for t seconds and the velocity of the exhaust is c km/s. The ratio of the mass of the rocket filled with fuel to its mass without fuel is R. Suppose a rocket has a mass ratio of 25, a firing time of 100 s and an exhaust velocity of 2.8 km/s. Can the spacecraft attain a stable orbit 300 km above Earth?