SECONDARY MATH 3

OBJECTIVE

1. I can solve Logarithmic and Exponential functions using one as the inverse of the other.

NOTES

Logarithmic Equality:
If $\log_b x = \log_b y$ then, $x = y$.
Exponential Equality:
If $b^x = b^y$ then, $x = y$.
Recall:
$\log_b x = y$ is true if and only if $b^y = x$

Solving Logarithms or Exponentials:
1. Isolate the log or the exponential term.
2. Perform the inverse operation.
3. Simplify and isolate variable.

Applications for Logarithms/ Exponents:

Interest: $A = P\left(1 + \frac{r}{n}\right)^{nt}$ or $A = Pe^{rt}$

Mortgage: $P = \dfrac{rM}{1-\left(1+\frac{r}{n}\right)^{-nt}} \div n$

Population Growth/Decay: $P_1 = P_0(1 \pm r)^t$ or $P_1 = P_0 e^{rt}$

Earthquake measurement (Richter Scale):
$$R = 0.67\log(0.37E) + 1.46$$

Heating/Cooling: $T = (T_0 - T_R)e^{-rt} + T_R$

Sound levels: $d = 10\log\left(\frac{P}{P_0}\right)$

PH levels: $pH = -\log(H+)$

And more…

EXAMPLES

Solve each equation.

1. $\log_7 x = 2$

2. $\log(x - 7) = \log 4$

3. $2^x = 2^{4x+3}$

4. $27^2 = 9^{x+1}$

5. $\ln(x - 3) + \ln(x + 4) = 3\ln 2$

6. $\log_4(x + 5) = -1$

7. $-5\log(2n + 7) = -13$

8. $1 + 4\log_7(x - 8) = 13$

9. If Hank invests $100 dollars at 8% interest compounded monthly, how long will it take before he has $150? How long would it take if it was compounded continuously?

10. You are cooking stew. When you remove it from the stove, its temperature is 212°F. The room temperature is 70°F, and the cooling rate of the stew is $r = 0.046$. How long will it take to cool the stew to a serving temperature of 100°F?