Honor Algebra II

Notes Section 4.6

Solve Exponential and Logarithmic Equations

Exponential Equation: equations in which variable expressions occur as exponents.

Logarithmic Equations: equations that involve logarithms of variable expressions.

Newton's Law of Cooling: $T = (T_0 - T_R)e^{-rt} + T_R$

T_0 = _____ T: _____

T_R = _____ r: _____

EXAMPLE 1 Solve.

a) $4^x = (1/2)^{x-3}$ b) $9^{2x} = 27^{x-1}$ c) $100^{7x+1} = 1000^{3x-2}$

EXAMPLE 2 Solve.

a) $4^x = 11$ b) $7^{9x} = 15$

EXAMPLE 3 You are driving on a hot day when your car overheats and stops running. It overheats at 280°F and can be driven again at 230°F. If $r = 0.0048$ and it is 80°F outside, how long (in minutes) do you have to wait until you can continue driving?

Newton's Law of Cooling: $T = (T_0 - T_R)e^{-rt} + T_R$

EXAMPLE 4 Solve.

a) $\log_5 (4x-7) = \log_5 (x+5)$

b) $\ln (7x-4) = \ln (2x+11)$

EXAMPLE 5 Solve.

a) $\log_4 (5x-1) = 3$

b) $\log_2 (x-6) = 5$

EXAMPLE 6 Solve.

a) $\log 2x = \log (x-5) = 2$

b) $\log_4 (x+12) + \log_4 x = 3$

EXAMPLE 7 The apparent magnitude of a star is a measure of the brightness of the star as it appears to observers on Earth. The apparent magnitude M of the dimmer star that can be seen with a telescope is given by the function

$M = 5\log D + 2$

where D is the diameter (in mm) of the telescope's objecitve lens. If a telescope can reveal stars with a magnitude of 12, what is the diameter of its objective lens?

$M = 5\log D + 2$