Trigonometry/Precalculus Name _____

§3.4a Solving Exponential Equations Date _____ Pd _____

Introduction

There are two basic strategies for solving exponential or logarithmic equations. The first is based on the One-to-One Properties and the second is based on the Inverse Properties. For $a > 0$ and $a \neq 1$, the following properties are true for all x and y for which $\log_a(x)$ and $\log_a(y)$ are defined.

One-to-One Properties	*Inverse Properties*
$a^x = a^y$ if and only if $x = y$	$a^{\log_a(x)} = x$
$\log_a(x) = \log_a(y)$ if and only if $x = y$	$\log_a(a^x) = x$

Strategies for Solving Exponential and Logarithmic Equations

1. Rewrite the original equation in a form that allows the use of the One-to-One Properties of exponential or logarithmic functions.
2. Rewrite an exponential equation in logarithmic form and apply the Inverse Property of logarithmic functions.
3. Rewrite a logarithmic equation in exponential form and apply the Inverse Property of exponential functions.

Example 1

Solve each equation.

(a) $2^x = 32$

(b) $(1/3)^x = 9$

(c) $e^x = 7$

Example 2

Solve each equation. Check your solution(s) with a graphing calculator.

(a) $4e^{2x} - 3 = 2$

(b) $2(3^{2t-5}) + 4 = 11$

Example 3

Solve the equation $e^{2x} - 3e^{x} + 2 = 0$. Check your solution(s) with a graphing calculator.

Example 4

You have deposited $500 in an account that pays 6.75% interest, compounded continuously. How long will it take your money to double?

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§3.4a Solving Exponential Equations HOMEWORK

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In Exercises 1-4, solve the exponential equation.

1. $4^x = 16$

2. $5^x = 1/625$

3. $2^{x+3} = 256$

4. $3^{x-1} = 1/81$

In Exercises 5-10, solve the exponential equation. Check your solution(s) with a graphing calculator.

5. $6^{5x} = 3000$

6. $5^{-t/2} = 0.2$

7. $6(8^{-2-x}) + 15 = 2601$

8. $\dfrac{400}{1+e^{-x}} = 350$

9. $e^{2x} - 4e^{x} - 5 = 0$

10. $e^{2x} - 5e^{x} + 6 = 0$

In Exercises 11-12, find the time required for a \$1000 investment to (a) double at interest rate r, compounded continuously, and (b) triple at interest rate r, compounded continuously.

11. $r = 7.5\%$

12. $r = 6\%$