

Note Frame/Step-Solution Map

Attachment D-7

Concept

Solving exponential equations with unlike bases

Problem

When bases in an exponential equation are unlike, and when each side of the equation cannot easily be converted to like bases, do the following:

Step 1

Take the logs of both sides of the equation.

Step 2

Use log properties to write as a single log.

Step 3

 Put any exponents as a coefficient in front of the logs.
Hint: Use log properties.

Step 4

Expand.

Step 5

Collect the unknown variables on one side of the equation.

Step 6

Factor out the unknown variables.

Step 7

Calculate.

Example

$$3^{3x+6} = 5^{x-5}$$

$$\log 3^{3x+6} = \log 5^{x-5}$$

$$(3x+6) \log 3 = (x-5) \log 5$$

$$3x \log 3 + 6 \log 3 = x \log 5 - 5 \log 5$$

$$3x \log 3 - x \log 5 = 5 \log 5 - 6 \log 3$$

$$x(3 \log 3 - \log 5) = 5 \log 5 - 6 \log 3$$

$$x = \frac{5 \log 5 - 6 \log 3}{3 \log 3 - \log 5}$$

$$x = -8.7$$