

SAT

$$|4x - 7| = 5 \rightarrow \begin{array}{l} 4x - 7 = 5 \\ x = 3 \end{array} \quad \begin{array}{l} 4x - 7 = -5 \\ x = \frac{1}{2} \end{array}$$

$$|3 - 8x| = 1$$

What value of x satisfies both of the equations above?

$$\begin{array}{l} 3 - 8x = 1 \\ x = \frac{1}{4} \end{array} \quad \begin{array}{l} 3 - 8x = -1 \\ x = \frac{1}{2} \end{array}$$

Solving Logarithmic Equations: Log Properties

Sometimes we have to simplify one side of an equation using log properties before we can write the equation in logarithmic form. Remember that your log properties are:

Product Property

$$\log_a mn = \log_a m + \log_a n$$

Quotient Property

$$\log_a \frac{m}{n} = \log_a m - \log_a n$$

Power Property

$$\log_a m^p = p \log_a m$$

Equality Property

If $\log_a m = \log_a n$, then $m = n$.

Examples:

a) $\log_3 x + \log_3 9 = \log_3 54$

$$\log_3 9x = \log_3 54$$

$$9x = 54$$

$$x = 6$$

d) $\log_2(x+2) + \log_2(x-1) = \log_2 4$

$$\log_2(x+2)(x-1) = \log_2 4$$

$$(x+2)(x-1) = 4$$

$$x^2 + x - 2 = 4$$

$$x^2 + x - 6 = 0$$

$$(x+3)(x-2) = 0$$

$$x = -3, 2$$

Examples:

f) $\log_b \sqrt{3} = \frac{1}{4}$

$$b^{\frac{1}{4}} = \sqrt{3}$$

$$b^{\frac{1}{4}} = 3^{\frac{2}{4}}$$

$$3^2 = b$$

Check:

$$(3^2)^{\frac{1}{4}} = 3^{\frac{2}{4}}$$

$$3^{\frac{2}{4}} = 3^{\frac{1}{2}}$$

$$b = 3^2$$

$$= 3^2 = 9$$

h) $\log_4(2x+1) - \log_4(x-2) = 1$

$$\log_4 \frac{2x+1}{x-2} = 1$$

$$(x-2)4^1 = \frac{2x+1}{x-2}$$

$$4x-8 = 2x+1$$

$$2x = 9$$

$$x = \frac{9}{2}$$

Check for Understanding: Find exact answers to each equation.

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

$$\ln(x-2)(2x-3) = \ln x^2$$

$$(x-2)(2x-3) = x^2$$

$$2x^2 - 7x + 6 = x^2$$

$$x^2 - 7x + 6 = 0$$

$$(x-1)(x-6) = 0$$

$$x = 1, 6$$

3. $\log_2(x^2 + 8) = \log_2 x + \log_2 6$

$$\log_2(x^2 + 8) = \log_2 6x$$

$$x^2 + 8 = 6x$$

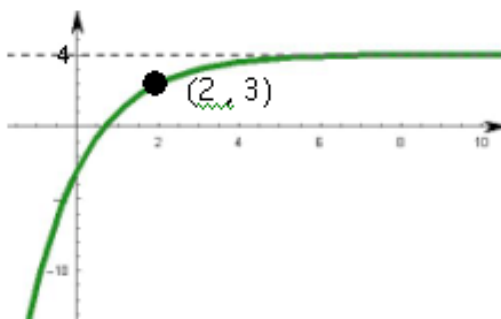
$$x^2 - 6x + 8 = 0$$

$$(x-4)(x-2) = 0$$

$$x = 4, 2$$

Extra Test Review questions.

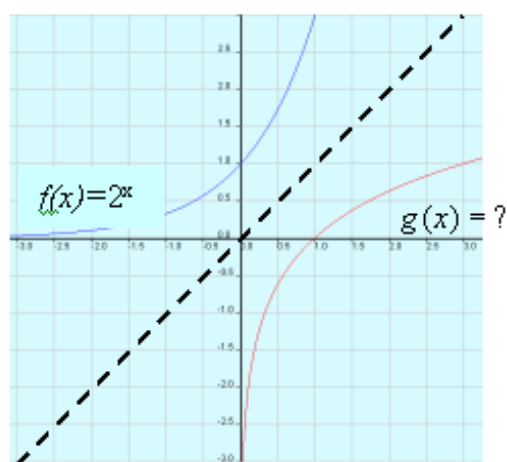
The graph of $f(x) = \frac{1}{3}^x$ has been transformed into $h(x)$ shown below:



- State the domain and range of $h(x)$.
- Write an equation for $h(x)$.

The equation of the function above the line $y = x$ is $f(x) = 2^x$.

- a) What is the relationship between $f(x)$ and $g(x)$?
- b) Find the equation for $g(x)$.



If $\log 5 = a$ and $\log 4 = b$, find in terms of a and b , expressions for

a) $\log_4 3$

b) $\log 36$