

7.4 Solving Logarithmic Equations and Inequalities
Honors Algebra 2

1. Solve the following equations:

a. $\log_{36} x = \frac{3}{2}$

$$36^{3/2} = x$$

$$\sqrt{36}^3 = x$$

$$\boxed{216 = x}$$

b. $\log_9 x = \frac{3}{2}$

$$9^{3/2} = x$$

$$\sqrt{9}^3 = x$$

$$\boxed{27 = x}$$

c. $\log_{16} x = \frac{5}{2}$

$$16^{5/2} = x$$

$$\sqrt{16}^5 = x$$

$$4^5 = x$$

$$\boxed{1024 = x}$$

KeyConcept Property of Equality for Logarithmic Functions

Symbols If b is a positive number other than 1, then $\log_b x = \log_b y$ if and only if $x = y$.

Example If $\log_5 x = \log_5 8$, then $x = 8$. If $x = 8$, then $\log_5 x = \log_5 8$.

2. Solve the following and check solutions.

a. $\log_2 (x^2 - 4) = \log_2 3x$

$$x^2 - 4 = 3x$$

$$x^2 - 3x - 4 = 0$$

$$(x-4)(x+1) = 0$$

$$x = \cancel{-1}, 4$$

$$\boxed{x = 4}$$

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b. $\log_3(x^2 - 5) = \log_3 2x$

$$x^2 - 5 = 2x$$

$$x^2 - 2x - 5 = 0$$

① $x^2 - 2x = 5$

$$x^2 - 2x + 1 = 6$$

$$(x-1)^2 = 6$$

$$x-1 = \pm\sqrt{6}$$

$$x = 1 \pm \sqrt{6}$$

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

$$x^2 - 1 = 3$$

$$x^2 = 4$$

$$x = \pm 2$$

② $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$$= \frac{2 \pm \sqrt{4 - 4(1)(-5)}}{2(1)}$$
$$= \frac{2 \pm \sqrt{24}}{2}$$
$$= \frac{2 \pm 2\sqrt{6}}{2}$$
$$= 1 \pm \sqrt{6}$$