

27. Solve the following equations.

$$\text{a) } \log_6(x-5) = 2 - \log_6 x$$

Restrictions: $x > 5$ and $x > 0$

$$S = \{9\}$$

$$\text{b) } \log(x+3) = 1 - \log x$$

Restrictions: $x > -3$ and $x > 0$

$$S = \{2\}$$

$$\text{c) } \log_2(x+1) + \log_2(x-1) = 3$$

Restrictions: $x > -1$ and $x > 1$

$$S = \{3\}$$

$$\text{d) } \log_2(x+2) = 2 - \log_2(x-1)$$

Restrictions: $x > -2$ and $x > 1$

$$S = \{2\}$$

28. Solve the following equations.

$$\text{a) } \log(x+1) = \log 6 - \log x$$

Restrictions: $x > 0$ and $x > -1$

$$S = \{2\}$$

$$\text{b) } \ln(x-2) + \ln 3 = \ln(x+1)$$

Restrictions: $x > 2$ and $x > -1$

$$S = \left\{\frac{7}{2}\right\}$$

$$\text{c) } \log_2(x+1) - \log_2 2 = \log_2 5 - \log_2(x-2)$$

Restrictions: $x > -1$ and $x > 2$

$$S = \{4\}$$

$$\text{d) } \ln(x+3) - \ln(x+1) = \ln(x-3) - \ln(x-2)$$

Restrictions: $x > -3$; $x > -1$; $x > 3$; $x > 2$

$$S = \emptyset$$

29. Solve the following equations.

$$\text{a) } \log_5(x+2) + \log_5(x-2) - \log_5 4 = \log_5 3$$

Restrictions: $x > -2$ and $x > 2$

$$S = \{4\}$$

$$\text{b) } \log_5(x^2-4) - \log_5 4 = \log_5 3$$

Restrictions: $x \in]-\infty, -2[\cup]2, +\infty[$

$$S = \{-4, 4\}$$

$$\text{c) } \log_5(x+2) = 1 - \log_5(x-2)$$

Restrictions: $x > -2$ and $x > 2$

$$S = \{3\}$$

$$\text{d) } \log_5(x^2-4) = 1$$

Restrictions: $x \in]-\infty, -2[\cup]2, +\infty[$

$$S = \{-3, 3\}$$

30. a) Solve the equation $\log_2(x+1) + \log_2(x-1) = 3$.

Restrictions: $x > -1$ and $x > 1$; $S = \{3\}$

b) Solve the equation $\log_2(x^2-1) = 3$.

Restrictions: $x^2-1 > 0 \Leftrightarrow x \in]-\infty, -1[\cup]1, +\infty[$; $S = \{-3, 3\}$

c) Explain why the equations $\log_2(x+1) + \log_2(x-1) = 3$ and $\log_2(x^2-1) = 3$ are not equivalent.

The equations do not have the same solution set.

31. Solve the following exponential equations.

a) $3^{2x-1} = 2^{x+2}$

$$S = \left\{ \log_{\frac{3}{2}} 12 \right\} = \frac{\log 12}{\log \frac{3}{2}} = 1.65$$

b) $2^{x+1} = 5^{1-x}$

$$S = \left\{ \log \frac{5}{2} \right\} = 0.398$$

c) $\frac{2^{x+1}}{5^x} = 3$

$$S = \left\{ \log_{\frac{5}{2}} \frac{3}{2} \right\} = \frac{\log \frac{3}{2}}{\log \frac{5}{2}} = -0.44$$

32. Solve the following equations.