

Name: **KEY**

Section 5.4 – Solving Logarithms – Check for Extraneous Roots

1. Solve:

$$\log(x+3) + \log x = 1$$

$$\log x(x+3) = 1$$

$$10^1 = x(x+3)$$

$$10 = x^2 + 3x$$

$$0 = x^2 + 3x - 10$$

$$0 = (x+5)(x-2)$$

$$x = -5 \quad \boxed{x = 2}$$

↑
Reject

2. Solve:

$$2 \log_3 x + \log_3(x-1) = 1 + \log_3 2x$$

$$\log_3 x^2 + \log_3(x-1) - \log_3 2x = 1$$

$$\log_3 \frac{x^2(x-1)}{2x} = 1 \rightarrow 3^1 = \frac{x^2(x-1)}{2x}$$

$$6x = x^2(x-1) \quad \text{cancel } x \text{ but test it}$$

as $x = 0$

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

$$6 = x^2 - x$$

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

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

$$\boxed{x = 3}$$

$$x = -2 \leftarrow \text{Reject}$$

3. Solve:

$$\log_2(3x+1) + \log_2(x-1) = \log_2(10x+14)$$

$$\log_2(3x+1)(x-1) = \log_2(10x+14)$$

$$(3x+1)(x-1) = 10x+14$$

$$3x^2 - 3x + x - 1 - 10x - 14 = 0$$

$$3x^2 - 12x - 15 = 0$$

$$(3x+3)(x-5) = 0$$

$$\text{Reject} \rightarrow x = -1 \quad \boxed{x = 5}$$

4. Solve:

$$\log_x 12 - \log_x(x-1) = 1$$

$$\log_x \frac{12}{x-1} = 1$$

$$x^1 = \frac{12}{x-1} \rightarrow x(x-1) = 12$$

$$x^2 - x - 12 = 0$$

$$(x-4)(x+3) = 0$$

$$\boxed{x = 4}$$

$$x = -3$$

↑
Reject

5. Solve:

$$2\log(3-x) = \log 2 + \log(22-2x)$$

$$\log(3-x)^2 = \log 2(22-2x)$$

$$(3-x)^2 = 44-4x$$

$$(3-x)(3-x) = 44-4x$$

$$9-6x+x^2-44+4x=0$$

$$x^2-2x-35=0$$

$$(x-7)(x+5)=0$$

Reject \rightarrow $x=7$

$$\boxed{x=-5}$$

6. Solve for x

$$\log_3[\log_x(\log_2 8)] = -1$$

$$\log_3[\log_x(\log_2 2^3)] = -1$$

$$\log_3[\log_x(3\log_2 2)] = -1$$

$$\log_3(\log_x 3) = -1$$

$$3^{-1} = \log_x 3$$

$$x^{1/3} = 3$$

$$\boxed{x=27}$$

7. Solve:

$$\log_3(2-4x) - \log_3(3-x) = 2$$

$$\log_3 \frac{(2-4x)}{3-x} = 2 \quad \rightarrow \quad 3^2 = \frac{(2-4x)}{(3-x)}$$

$$9(3-x) = (2-4x)$$

$$27-9x = 2-4x$$

$$27-9x+4x = 2$$

$$-5x = -25$$

$$x = 5$$

\uparrow
Reject

$$\boxed{\text{NO SOLUTION}}$$