

4.5 WS 3

KEY

Solve the following equations. Be sure to check your answers.

1. $8^t = -6$

No Solution

2. $12 = \log(4t)$

$$\frac{10^{12}}{4} = \frac{4t}{4}$$

$$t = \frac{10^{12}}{4}$$

$t = 2.5 \times 10^{11}$

3. $17 = 3^x$

$$\log 17 = x \log 3$$

$$x = \frac{\log 17}{\log 3}$$

$x = 2.58$

4. $-1 = \log(x+3)$

$$x+3 = \frac{1}{10}$$

$$10x+30 = 1$$

$$10x = -29$$

$x = -2.9$

5. $4 = 15 - e^{x-8}$

$$-11 = -e^{x-8}$$

$$11 = e^{x-8}$$

$$\ln 11 = x-8$$

$$x = \ln(11) + 8$$

$x = 10.4$

6. $\log(x+3) = \frac{1}{2}$

$$x+3 = \sqrt{10}$$

$$x = \sqrt{10} - 3$$

$x = 0.16$

7. $29 + 10^{t+12} = 74$

$$10^{t+12} = 45$$

$$(t+12) \ln 10 = \ln 45$$

$$t+12 = \frac{\ln 45}{\ln 10}$$

$$t = \frac{\ln 45}{\ln 10} - 12$$

$t = -10.35$

8. $1 = \log_4 2 + \log_4(3+x)$

$$1 = \log_4(2(3+x))$$

$$1 = \log_4(6+2x)$$

$$6+2x = 4$$

$$2x = -2$$

$x = -1$

9. $\log(t+3) + \log(t) = 1$

$$\log(t^2+3t) = 1$$

$$t^2+3t = 10$$

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

$$\sqrt{5-2}$$

$$t = \cancel{2}, 2$$

$t = 2$

10. $\log_2(t+1) + \log_2(t-1) = 5$

$$\log_2(t^2-1) = 5$$

$$t^2-1 = 2^5$$

$$t^2-1 = 32$$

$$t^2 = 33$$

$$t = \sqrt{33}$$

11. $\log_3(4t) = 1 - \log_3(3t)$

$$\log_3(4t) + \log_3(3t) = 1$$

$$\log_3(12t^2) = 1$$

$$12t^2 = 3$$

$$t^2 = \frac{1}{4} \quad t = \pm \frac{1}{2}$$

$$t = \frac{1}{2}$$

12. $e^{2x} - e^x - 6 = 0$

$$u = e^x$$

$$u^2 - u - 6 = 0$$

$$u = 3, -2$$

$$e^x = 3$$

$$e^x = -2$$

$$x = \ln 3$$

$$x = \ln -2$$

$$x = 1.1$$

Write each equation in its exponential form.

13. $3 = \log_3 27$

$$3^3 = 27$$

14. $4 = \log_{10} 10,000$

$$10^4 = 10,000$$

15. $\ln x = 5$

$$e^5 = x$$

16. $\log_5(x+1) = 3$

$$5^3 = x+1$$

Write each equation in its logarithmic form. Assume $y > 0$ and $b > 0$.

17. $2^4 = 16$

$$\log_2 16 = 4$$

18. $4^3 = 64$

$$\log_4 64 = 3$$

19. $54.60 = e^4$

$$\ln 54.60 = 4$$

20. $e^6 = (x+3)$

$$\ln(x+3) = 6$$

Find the domain of the function.

21. $f(x) = \log_2(11-x)$

$$11-x > 0$$

$$-x > -11$$

$$x < 11$$

$$D_x \text{ of } f(x) : \{x | x < 11\}$$

or

$$(-\infty, 11)$$

22. $f(x) = \log(x^2 + 7x + 10)$

$$x^2 + 7x + 10 > 0$$

$$\hat{5}2$$

$$\text{c.v. } -5, -2$$

| | | | | | |
|---|---|--|---|--|---|
| $x+5$ | - | | + | | + |
| $x+2$ | - | | - | | + |
| $\oplus \quad -5 \quad \ominus \quad -2 \quad \oplus$ | | | | | |

$$D_x \text{ of } f(x) : (-\infty, -5) \cup (-2, \infty)$$

23. $f(x) = \log_3 x$

$$x > 0$$

$$D_x \text{ of } f(x) : (0, \infty)$$

or

$$\{x | x > 0\}$$

24. $f(x) = \log\left(\frac{4}{x+2}\right)$

$$\frac{4}{x+2} > 0 \quad x \neq -2$$

| | | | |
|---------------------------------|---|--|---|
| 4 | + | | + |
| $x+2$ | - | | + |
| $\ominus \quad -2 \quad \oplus$ | | | |

$$D_x \text{ of } f(x) : (-2, \infty)$$