

7C/D Practice Problems

Exponential + Logarithmic Equations

1. $3^{x-1} = 81$
 $3^{x-1} = 3^4$
 $x-1=4$
 $x=5$

2. $8^x = 4$
 $2^{3(x)} = 2^2$
 $3x=2$
 $x=2/3$

3. $e^x = 5$
 $\ln e^x = \ln 5$
 $x = \ln 5$
 $x \approx 1.609$

4. $-14 + 3e^x = 11$
 $3e^x = 25$
 $\ln e^x = \ln \frac{25}{3}$
 $x = \ln(25/3)$
 $x \approx 2.12$

5. $-6 + \ln 3x = 0$
 $\ln(3x) = 6$
 $e^6 = 3x$
 $x = \frac{e^6}{3}$
 $x \approx 134.476$

6. $\log(3x+1) = 2$
 $10^2 = 3x+1$
 $100 = 3x+1$
 $99 = 3x$
 $x = 33$

7. $\ln x - \ln 3 = 4$
 $\ln\left(\frac{x}{3}\right) = 4$
 $e^4 = \frac{x}{3}$
 $x = 3e^4$
 $x \approx 163.794$

8. $2 \ln(3x) = 4$
 $\ln(3x) = 2$
 $e^2 = 3x$
 $x = e^2/3$
 $x \approx 2.463$

9. $5^{x+2} = 4$
 $(x+2) \log 5 = \log 4$
 $(x+2) = \frac{\log 4}{\log 5}$
 $x = \left(\frac{\log 4}{\log 5}\right) - 2$
 $x \approx -1.139$

10. $\ln(x+2)^2 = 6$
 $\sqrt{e^6} = \sqrt{(x+2)^2}$
 $\pm \sqrt{e^6} = x+2$
 $x = -2 + e^3, -2 - e^3$
 $x \approx 18.086, -22.096$

11. $4^{-3x} = .025$
 $4^{-3x} = \frac{1}{4}$
 $4^{-3x} = 4^{-1}$
 $-3x = -1$
 $x = \frac{1}{3}$

12. $2e^{2x} - 5e^x - 3 = 0$
 Let $u = e^x$ for ease
 $2u^2 - 5u - 3 = 0$
 $\left(\frac{2u-6}{2}\right)\left(\frac{2u+1}{2}\right) = 0$
 $(u-3)(2u+1) = 0$
 $u = 3 \quad u = -1/2$
 $e^x = 3 \quad e^x = -1/2$
 $x = \ln 3$
 $x = 1.099$

13. $\log_7 3 + \log_7 X = \log_7 32$

$\log_7 (3x) = \log_7 (32)$

$3x = 32$

$x = 32/3$

14. $2 \log_6 (4x) = 0$

$\log_6 (4x) = 0$

$6^0 = 4x = 1$

$x = 1/4$

15. $\log_2 (x) + \log_2 (x-3) = 2$

$\log_2 [x(x-3)] = 2$

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

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

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

$x = 4$

16. $\log_2 (x+5) - \log_2 (x-2) = 3$

$\log_2 \left(\frac{x+5}{x-2} \right) = 3$

$\frac{x+5}{x-2} = 2^3$

$8(x-2) = x+5$

$8x - 16 = x + 5$

$x = 3$

17. $4 \ln (2x+3) = 11$

$\ln (2x+3) = 11/4$

$e^{11/4} = 2x+3$

$x = \frac{e^{11/4} - 3}{2}$
 $x \approx 6.321$

18. $\log x - \log 6 = 2 \log 4$

$\log \left(\frac{x}{6} \right) = \log 4^2$

$\frac{x}{6} = 16$

$x = 96$

19. $2^x = 64$

$2^x = 2^6$

$x = 6$

20. $5^x = 25$

$5^x = 5^2$

$x = 2$

21. $4^{x-3} = \frac{1}{16}$

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

$x = 1$

22. $3^{x-2} = 81$

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

$x = 6$

23. $\log_3 x = 5$

$3^5 = x$

$x = 243$

24. $\log_4 x = 3$

$4^3 = x$

$x = 64$

25. $\log_2(2x) = \log_2(100)$

$$2x = 100$$

$$\boxed{x = 50}$$

26. $\ln(x+4) = \ln(7)$

$$x+4 = 7$$

$$\boxed{x = 3}$$

27. $\log_3(2x+1) = 2$

$$3^2 = 2x+1$$

$$2x+1 = 9$$

$$2x = 8$$

$$\boxed{x = 4}$$

28. $\log_5(x-10) = 2$

$$5^2 = x-10$$

$$25 = x-10$$

$$\boxed{x = 35}$$

29. $\log_3^x = 500$

$$x \log 3 = \log 500$$

$$\boxed{x = \log 500 / \log 3}$$

$$x \approx 5.66$$

30. $8^x = 1000$

$$x \log 8 = \log 1000$$

$$\boxed{x = \log 1000 / \log 8}$$

$$x \approx 3.32$$

31. $\ln x = 7.25$

$$e^{7.25} = x$$

$$\boxed{x = e^{7.25}}$$

$$x \approx 1408.1$$

32. $\ln x = -0.5$

$$e^{-1/2} = x$$

$$\boxed{x = 1/\sqrt{e}}$$

$$x \approx 0.61$$

33. $2e^{1.5x} = 45$

$$e^{1.5x} = 45/2$$

$$\frac{1}{2}x \ln e = \ln(45/2)$$

$$\boxed{x = 2 \ln(45/2)}$$

$$x \approx 6.23$$

34. $100e^{-0.6x} = 20$

$$e^{-3/5x} = 1/5$$

$$-\frac{3}{5}x \ln e = \ln(1/5)$$

$$\boxed{x = -\frac{5}{3} \ln(1/5)}$$

$$x \approx 2.68$$

35. $12(1-4^x) = 18$

$$1-4^x = 3/2$$

$$-4^x = 1/2$$

$$4^x = -1/2$$

No solution

36. $25(1-e^t) = 12$

$$1-e^t = 12/25$$

$$-e^t = -13/25$$

$$e^t = 13/25$$

$$\boxed{t = \ln(13/25)}$$

$$\approx -0.65$$

37. $\log(2x) = 1.5$

$$10^{3/2} = 2x$$

$$x = 10^{3/2}/2$$
$$x \approx 15.81$$

38. $\log_2(2x) = -0.65$

$$2^{-0.65} = 2x$$

$$x = 1/2^{0.65} = 1/2^{0.65}$$

$$x \approx 0.32$$

39. $\frac{1}{3} \log_2 x + 5 = 7$

$$\frac{1}{3} \log_2 x = 2$$

$$\log_2 x = 6$$

$$2^6 = x$$

$$x = 64$$

40. $4 \log_5(x+1) = 4.8$

$$\log_5(x+1) = 1.2$$

$$5^{1.2} = x+1$$

$$x = 5^{1.2} - 1$$

$$x \approx 5.9$$

41. $\log_2 x + \log_2 3 = 3$

$$\log_2(3x) = 3$$

$$2^3 = 3x$$

$$x = 8/3$$

42. $2 \log_4 x - \log_4(x-1) = 1$

$$\log_4 x^2 - \log_4(x-1) = 1$$

$$\log_4 \left(\frac{x^2}{x-1} \right) = 1$$

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

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

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

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

$$x = 2$$