Precalculus
Section 3.5

Name Key
Period_____ Date_____

Find the exact solution algebraically, and check it by substituting into the original equation.

1. $32\left(\frac{1}{4}\right)^{\frac{x}{3}} = 2$

$\left(\frac{1}{4}\right)^{x/3} = \frac{1}{16}$

$\left(\frac{1}{4}\right)^{x/3} = \left(\frac{1}{4}\right)^2$

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

$x = 6$

2. $3 \cdot 4^{\frac{x}{2}} = 96$

$4^{\frac{x}{2}} = 32$

$2^{2(x/2)} = 2^5$

$x = 5$

3. $3\left(5^{-\frac{x}{4}}\right) = 15$

$5^{(-x/4)} = 5$

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

$x = -4$

4. $\log_2 x = 5$

$2^5 = x$

$x = 32$

5. $\log_4(1 - x) = 1$

$4^1 = (1-x)$

$3 = -x$

$x = -3$

6. $0.98^x = 1.6$

$\log_{.98} 1.6 = x$

$x = -23.264$

7. $80e^{0.045x} = 240$

$e^{.045x} = 3$

$\ln 3 = .045x$

$x = \frac{\ln 3}{.045}$ $x = 24.41$

8. $7 - 3e^{-x} = 2$

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

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

$\ln 5/3 = -x$

$x = -.5108$

9. $3 - \log(x + 2) = 5$

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

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

$10^{-2} = x+2$

$x = -1.99$

10. $5^{x-4} = 25^{x-6}$

$5^{x-4} = 5^{2(x-6)}$

$x-4 = 2x-12$

$8 = x$

11. $7^{3x-4} = 49^{2x+1}$

$7^{3x-4} = 7^{2(2x+1)}$

$3x-4 = 4x+2$

$-6 = x$

12. $8^{x-1} = 32^{3x-2}$

$2^{3(x-1)} = 2^{5(3x-2)}$

$3x-3 = 15x-10$

$7 = 12x$

$x = 7/12$

13. $27^{4x-1} = 9^{3x+8}$

$3^{3(4x-1)} = 3^{2(3x+8)}$

$12x-3 = 6x+16$

$6x = 19$

$x = 19/6$

14. $5.2\log_4 2x = 16$

$\log_4(2x) = 16$

$\log_4(2x) = \frac{16}{5.2}$

$4^{\frac{16}{5.2}} = 2x$

$x = 35.6$

15. $4\ln(-x) + 3 = 21$

$-3 \quad -3$

$\frac{4}{4}\ln(-x) = \frac{18}{4}$

$\ln(-x) = 4.5$

$e^{4.5} = -x$

$x = -90.02$

16. $\log 8 + \log x = 2$

$\log(8x) = 2$

$10^2 = 8x$

$100 = 8x$

$x = 12.5$

17. $\log 9 + \log x = \log 77$

$\log(9x) = \log 77$

$9x = 77$

$x = 8.56$

18. $\log x - \log 7 = 1$

$\log \frac{x}{7} = 1$

$10^1 = \frac{x}{7}$

$x = 70$

19. $\log x - \log 3 = \log 35$

$\log \frac{x}{3} = \log 35$

$\frac{x}{3} = 35$

$x = 105$

20. $\log x + \log 7 = 1$

$\log 7x = 1$

$10^1 = 7x$

$x = \frac{10}{7}$

$x = 1.43$

21. $\log x - \log 2 = 1$

$\log \frac{x}{2} = 1$

$10^1 = \frac{x}{2}$

$x = 20$

22. $\log_6(x^2 - 2) - \log_6 8 = 1$

$\log_6 \frac{(x^2-2)}{8} = 1$

$6^1 = \frac{x^2-2}{8}$

$48 = x^2 - 2$

$50 = x^2$

$x = \pm\sqrt{50}$

$x = \pm 5\sqrt{2}$

23. $\log_4(x + 2) - \log_4 x = 2$

$\log_4 \frac{(x+2)}{x} = 2$

$4^2 = \frac{x+2}{x}$

$16x = x + 2$

$15x = 2$

$x = 2/15$

24. $\ln(x + 2) - \ln x = 3$

$\ln \frac{(x+2)}{x} = 3$

$e^3 = \frac{x+2}{x}$

$e^3 x = x + 2$

$e^3 x - x = 2$

$x(e^3 - 1) = 2$

$x = \frac{2}{e^3 - 1}$

$x = .1047$

25. $\ln(x + 10) + \ln(x + 1) = \ln 22$

$\ln(x+10)(x+1) = \ln 22$

$(x+10)(x+1) = 22$

$x^2 + x + 10x + 10 = 22$

$x^2 + 11x + 10 = 22$

$x^2 + 11x - 12 = 0$

$(x + 12)(x - 1) = 0$

$\cancel{x = -12}$ $x = 1$

26. $\log_3(x) - \log_3(x + 3) = \log_3 24$

$\log_3 \frac{x}{x+3} = \log_3 24$

$\frac{x}{x+3} = 24$

$x = 24x + 72$

$-72 = 23x$

$\cancel{x = -3.13}$ No solution

Solve graphically.

27. $e^x + x = 5$

$x = 1.307$

28. $e^{2x} - 8x + 1 = 0$

$x = .4072$

$x = .933$

29. $e^x < 5 + \ln x$ $\quad 0 < -e^x + 5 + \ln x$

$x = 1.711$

$0 < x < 1.711$

$(0, 1.711)$

30. $\ln|x| - e^{2x} \geq 3$ $\quad$ Make window bigger

$\ln|x| - e^{2x} - 3 \geq 0$

$-\infty < x \leq -20.09$

$(-\infty, -20.09]$