

# Algebra 2 Assignment 47 Key

NEW

$$1. \log_5 5x = 2 \rightarrow 5x = 5^2 \rightarrow \frac{5x}{5} = \frac{25}{5} \rightarrow \boxed{x = 5}$$

$$2. \log_3(2x-3) = 2 \rightarrow 2x-3 = 3^2 \rightarrow 2x-3 = 9 \rightarrow 2x = \frac{12}{2} \rightarrow \boxed{x = 6}$$

$$3. \ln x = -3 \rightarrow \boxed{x = e^{-3}}$$

$$4. \ln(x+3) = 4 \rightarrow x+3 = e^4 \rightarrow \boxed{x = e^4 - 3}$$

$$5. \log_5 2 + \log_5(3x-2) = 1 \rightarrow \log_5 [2(3x-2)] = 1 \rightarrow 2(3x-2) = 5^1$$

$$\rightarrow \frac{6x-4}{+4} = 5 \rightarrow \frac{6x}{6} = \frac{9}{6} \rightarrow x = \frac{9}{6} = \boxed{\frac{3}{2}}$$

$$6. \log_5(y-12) + \log_5(y+12) = 2 \rightarrow \log_5 [(y-12)(y+12)] = 2$$

$$\rightarrow (y-12)(y+12) = 5^2 \rightarrow y^2 - 144 = 25 \rightarrow y^2 = 169$$

$$\rightarrow \sqrt{y^2} = \pm \sqrt{169} \rightarrow \boxed{y = 13} \quad (-13 \text{ makes the argument negative})$$

$$7. 2\log_3 x - \log_3(x-2) = 2 \rightarrow \log_3 \left( \frac{x^2}{x-2} \right) = 2 \rightarrow \frac{(x-2)x^2}{(x-2)} = 3^2(x-2)$$

$$\rightarrow x^2 = 9(x-2) \rightarrow x^2 = 9x - 18 \rightarrow x^2 - 9x + 18 = 0$$

$$\rightarrow (x-6)(x-3) = 0 \rightarrow x-6=0, x-3=0 \rightarrow \boxed{x = 6, 3}$$

$$8. \log_3(5x+5) - \log_3(x^2-1) = 0 \rightarrow \frac{5x+5}{x^2-1} = 3^0 \rightarrow \frac{5(x+1)}{(x+1)(x-1)} = 1$$

$$\rightarrow \frac{5}{(x-1)} = 1 \rightarrow 5 = x-1 \rightarrow \boxed{6 = x}$$

$$9. \log_4 5x = \log_4 2 \rightarrow 5x = 2 \rightarrow \boxed{x = \frac{2}{5}}$$

$$10. \log_4(3x-1) = \log_4(2x+3) \rightarrow 3x-1 = 2x+3 \rightarrow \boxed{x = 4}$$

$$11. \log_8(3x-1) = \log_8(2x^2) \rightarrow 3x-1 = 2x^2 \rightarrow 0 = 2x^2 - 3x + 1$$

$$\rightarrow 0 = (2x-1)(x-1) \quad 0 = 2x-1 \quad 0 = x-1 \quad \boxed{x = \frac{1}{2}, 1}$$

$$12. \ln 4 - \ln x = \ln 3 \rightarrow \ln\left(\frac{4}{x}\right) = \ln(3) \rightarrow \frac{4}{x} = 3 \cdot x$$

$$\rightarrow \frac{4}{3} = 3x \rightarrow \boxed{x = \frac{4}{3}}$$

$$13. 2\log_3 6 - \frac{1}{4}\log_3 16 = \log_3 x \rightarrow \log_3\left(\frac{6^2}{16^{1/4}}\right) = \log_3 x$$

$$\rightarrow \frac{36}{2} = x \rightarrow \boxed{18 = x}$$

$$14. \log_5(x^2+7) = \frac{2}{3}\log_5(64) \rightarrow \log_5(x^2+7) = \log_5(64^{2/3})$$

$$\rightarrow x^2+7 = 16 \rightarrow x^2 = 9 \rightarrow \sqrt{x^2} = \pm\sqrt{9} \rightarrow \boxed{x = \pm 3}$$

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

$$\rightarrow x^2 - 2x = 3 \rightarrow x^2 - 2x - 3 = 0 \rightarrow (x-3)(x+1) = 0$$

$$\rightarrow x-3=0, x+1=0$$

$$\boxed{x=3} \quad \cancel{x=-1} \quad (-1 \text{ makes a neg. argument})$$

### REVIEW

$$16. 11m^2 - 12m = 10 \quad a=11, b=-12, c=-10$$

$$11m^2 - 12m - 10 = 0$$

$$x = \frac{-(-12) \pm \sqrt{(-12)^2 - 4(11)(-10)}}{2(11)} = \frac{12 \pm \sqrt{144 + 440}}{22} = \frac{12 \pm \sqrt{584}}{22}$$

$$\rightarrow x = \frac{12 \pm 2\sqrt{146}}{22} \rightarrow \boxed{x = \frac{6 \pm \sqrt{146}}{11}}$$

$$17. f(x) = 3x^2 + 9x + 8$$

$$h = \left(-\frac{9}{2(3)}\right) = -\frac{9}{6} = -\frac{3}{2}$$

$$k = 3\left(-\frac{3}{2}\right)^2 + 9\left(-\frac{3}{2}\right) + 8$$

$$= 3\left(\frac{9}{4}\right) - \frac{27}{2} + 8$$

$$= \frac{27}{4} - \frac{54}{4} + \frac{32}{4} = \frac{5}{4}$$

$$\text{vertex: } \left(-\frac{3}{2}, \frac{5}{4}\right)$$

$$\text{opens up}$$

$$f(x) = 3\left(x + \frac{3}{2}\right)^2 + \frac{5}{4}$$

$$18. \{(3,7), (1,4), (-2,7), (0,3)\}$$

$$\text{Inverse: } \{(7,3), (4,1), (7,-2), (3,0)\} \quad \text{Not a function}$$

$$\sqrt{584}$$

$$\begin{array}{r} 4 \overline{) 146} \\ \underline{4} \phantom{0} \\ 2 \phantom{0} \end{array}$$

19.  $f(x) = \frac{x-1}{5}$ ,  $g(x) = 5x-1$

$$f(g(x)) = \frac{(5x-1)-1}{5} = \frac{5x-2}{5} \neq x$$

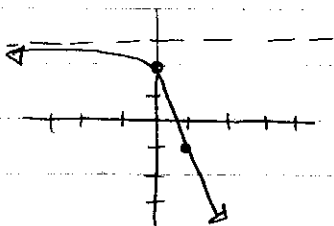
Not inverses.

20.  $g(x) = -4^x + 3$

$(0, 1) \rightarrow (0, 2)$

$(1, 4) \rightarrow (1, -1)$

HA:  $y = 3$

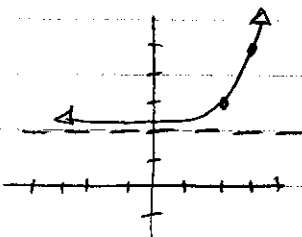


21.  $y = 3^{x-2} + 2$

$(0, 1) \rightarrow (2, 3)$

$(1, 3) \rightarrow (3, 5)$

HA:  $y = 2$

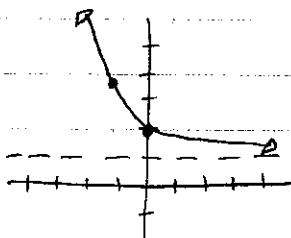


22.  $y = e^{-x} + 1$

$(0, 1) \rightarrow (0, 2)$

$(1, 2.7) \rightarrow (-1, 3.7)$

HA:  $y = 1$



23.  $\log_9 81 \rightarrow 9^x = 81 \quad x = \boxed{2}$

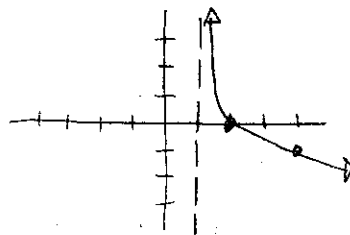
24.  $\ln\left(\frac{1}{e}\right) = \ln(e^{-1}) \Rightarrow e^x = e^{-1} \quad x = \boxed{-1}$

25.  $g(x) = -\log_3(x-1)$

$(1, 0) \rightarrow (2, 0)$

$(3, 1) \rightarrow (4, -1)$

VA:  $x = 1$

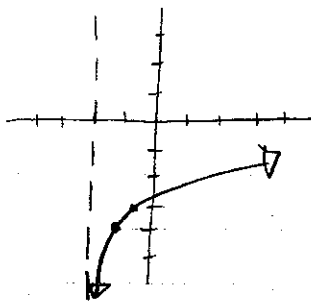


26.  $\ln(x+2) - 4$

$(1, 0) \rightarrow (-1, -4)$

$(2.7, 1) \rightarrow (0.7, -3)$

VA:  $x = -2$



$$27. \log_5(xyz) = \boxed{\log_5(x) + \log_5(y) + \log_5(z)}$$

$$28. \ln\left(\frac{\sqrt{x}}{y}\right) = \ln\sqrt{x} - \ln(y) = \boxed{\frac{1}{2}\ln(x) - \ln(y)}$$

$$29. \ln x + \ln 2 + \ln 5 = \ln(x \cdot 2 \cdot 5) = \boxed{\ln(10x)}$$

$$30. 3\ln x - \ln(x+1) + \ln(x-1) = \boxed{\ln\left(\frac{x^3(x-1)}{(x+1)}\right)}$$

$$31. 3^x = 81 \rightarrow 3^x = 3^4 \rightarrow \boxed{x=4}$$

$$32. 3^{6x-5} = 9^{4x-3} \rightarrow 3^{(6x-5)} = 3^{2(4x-3)}$$

$$\rightarrow \underset{-6x+6}{6x-5} = \underset{-6x+6}{8x-6} \rightarrow 1 = 2x \rightarrow \boxed{\frac{1}{2} = x}$$

$$33. f(x) = x^2 + 6x - 27 \quad \boxed{\text{vertex: } (-3, -36)}$$

$$34. \begin{aligned} x - y + 3 &= 0 \rightarrow y = x + 3 \\ y &= x^2 - 4x + 7 \end{aligned} \quad \boxed{(1, 4) \text{ and } (4, 7)}$$

$$35. y = 2500 e^{[(.035)(3)]} = \boxed{\$2776.78}$$

$$36. \log_7 84 = \frac{\log 84}{\log 7} = \boxed{2.277}$$

$$37. 7^x = 20 \rightarrow \log_7(20) = x \rightarrow \boxed{x = \frac{\log 20}{\log 7} = 1.540}$$

$$38. 6^{x+2} = 17 \rightarrow x+2 = \log_6 17 \rightarrow \boxed{x = \frac{\log 17}{\log 6} - 2 = -.419}$$

$$39. e^x + 5 = 60 \rightarrow e^x = 55 \rightarrow \boxed{x = \ln(55) = 4.007}$$