

Algebra 2 - Assignment 48 Key

NEW

$$1. y = 11(1.13)^t \quad 1.13 - 1 = .13 \quad \boxed{13\% \text{ growth}}$$

$$2. y = 15(.73)^t \quad .73 - 1 = -.27 \quad \boxed{27\% \text{ decay}}$$

$$3. y = 45\left(\frac{3}{2}\right)^t \quad \frac{3}{2} - 1 = 1.5 - 1 = .5 \quad \boxed{50\% \text{ growth}}$$

$$4. y = 3\left(\frac{3}{4}\right)^t \quad \frac{3}{4} - 1 = -\frac{1}{4} = -.25 \quad \boxed{25\% \text{ decay}}$$

$$5. p = 1500 \quad r = .09 \quad y = 2150 \quad t = ?$$

$$\frac{2150}{1500} = \frac{1500}{1500} e^{.09t} \rightarrow \ln \frac{215}{150} = \ln e^{.09t} \rightarrow \ln\left(\frac{215}{150}\right) = .09t$$

$$t = \frac{\ln\left(\frac{215}{150}\right)}{.09} = 4.000 \quad \boxed{4 \text{ years}}$$

$$6. p = x \quad y = 2x \quad r = .15 \quad t = ?$$

$$\frac{2x}{x} = \frac{x}{x} e^{.15t} \rightarrow \ln 2 = \ln e^{.15t} \rightarrow \frac{\ln(2)}{.15} = \frac{.15t}{.15}$$

$$t = \frac{\ln(2)}{.15} = \boxed{4.62 \text{ years}}$$

$$7. p = 1000 \quad y = 2500 \quad t = 10 \quad r = ?$$

$$\frac{2500}{1000} = \frac{1000}{1000} e^{10r} \rightarrow \ln\left(\frac{25}{10}\right) = \ln e^{10r} \rightarrow \frac{\ln\left(\frac{25}{10}\right)}{10} = \frac{10r}{10}$$

$$r = \frac{\ln\left(\frac{25}{10}\right)}{10} = .0916 \quad \boxed{9.16\% \text{ interest}}$$

$$8. p = 500 \quad y = 1000 \quad t = 7 \quad r = ?$$

$$\frac{1000}{500} = \frac{500}{500} e^{7r} \rightarrow \ln 2 = \ln e^{7r} \rightarrow \frac{\ln(2)}{7} = \frac{7r}{7}$$

$$r = \frac{\ln(2)}{7} = .0990 \quad \boxed{9.90\% \text{ interest}}$$

9a) $p = 6 \text{ billion}$ $r = 1.7\% = .017$ $t = 10$

$$y = 6e^{(.017)(10)} = 7.11$$

$$\boxed{7.11 \text{ billion}}$$

(+2)

b) $p = 6$ $y = 9$ $r = .017$ $t = ?$

$$\frac{9}{6} = \frac{6}{6} e^{.017t} \rightarrow \ln\left(\frac{3}{2}\right) = \ln e^{.017t} \rightarrow \ln\left(\frac{3}{2}\right) = .017t$$

$$\rightarrow t = \frac{\ln\left(\frac{3}{2}\right)}{.017} = \boxed{23.85 \text{ years}}$$

10.a) $p = 75,000$ $r = .06$ $t = 5$

$$y = 75,000 e^{(.06)(5)} = \boxed{\$101,239.41}$$

b) $p = 75,000$ $r = .06$ $y = 125,000$

$$\frac{125,000}{75,000} = \frac{75,000}{75,000} e^{.06t} \rightarrow \ln\left(\frac{5}{3}\right) = \ln e^{.06t} \rightarrow \ln\left(\frac{5}{3}\right) = .06t$$

$$t = \frac{\ln\left(\frac{5}{3}\right)}{.06} = \boxed{8.51 \text{ years}}$$

(+2)

11. half life = 2000 $n = 830$ $r = -\frac{\ln 2}{2000}$

a) $t = 105$

$$y = 830 e^{\left(\frac{-\ln(2)}{2000} \cdot 105\right)} = \boxed{800.34 \text{ g}}$$

(+2)

b) $\frac{200}{830} = \frac{830}{830} e^{\left(\frac{-\ln 2}{2000} \cdot t\right)} \rightarrow \ln\left(\frac{200}{830}\right) = \ln e^{\left(\frac{-\ln 2}{2000} \cdot t\right)}$

$$\rightarrow \ln\left(\frac{200}{830}\right) = \frac{-\ln 2}{2000} \cdot t \rightarrow t = \frac{\left(\ln\left(\frac{200}{830}\right)\right)}{\left(\frac{-\ln(2)}{2000}\right)} = \boxed{4106.22 \text{ years}}$$

12. $\frac{1}{2}$ life = 57 min $p = 35$ $r = \frac{-\ln(2)}{57}$

a) $t = 1.5 \text{ hours} = 90 \text{ min}$

$$y = 35 e^{\left(\frac{-\ln(2)}{57} \cdot 90\right)} = \boxed{11.72 \text{ mg}}$$

(+2)

b) $t = ?$

$$5 = 35 e^{\left(\frac{-\ln(2)}{57} t\right)} \rightarrow \ln\left(\frac{5}{35}\right) = \ln e^{\left(\frac{-\ln 2}{57} t\right)}$$

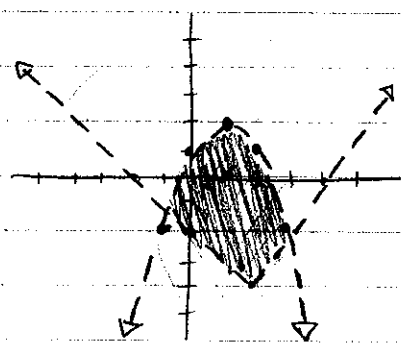
$$\rightarrow \ln\left(\frac{1}{7}\right) = \frac{-\ln 2}{57} \cdot t \rightarrow t = \frac{\left(\ln\left(\frac{1}{7}\right)\right)}{\left(\frac{-\ln(2)}{57}\right)} = \boxed{160.02 \text{ min.}}$$

REVIEW

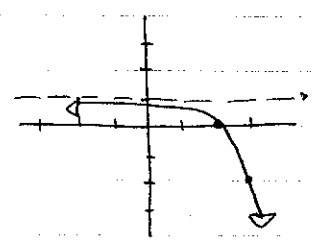
B. $5^{\frac{1}{2}} a^2 b^{\frac{2}{3}} = 5^{\frac{1}{2} \cdot \frac{3}{3}} a^{\frac{2}{1} \cdot \frac{6}{6}} b^{\frac{2}{3} \cdot \frac{2}{2}} = 5^{\frac{3}{6}} a^{\frac{12}{6}} b^{\frac{4}{6}} = \sqrt[6]{5^3 a^{12} b^4} = a^2 \sqrt[6]{125 b^4}$

14. $\frac{5}{4x+1} = \frac{3}{4x-1} \rightarrow 5(4x-1) = 3(4x+1)$
 $20x-5 = 12x+3$
 $\frac{-12x+5}{-12x+5} = \frac{12x+3}{-12x+5}$
 $8x = 8 \rightarrow \boxed{x=1}$

(x2) 15. $y > |x-2| - 4$
 $y < -(x-1)^2 + 2$



16. $y = -3^{x-2} + 1$
 $(0, 1) \rightarrow (2, 0)$
 $(1, 3) \rightarrow (3, -2)$
 HA: $y = 1$



17. $\log_{32} 2 = \frac{1}{5} \rightarrow \boxed{2 = 32^{\frac{1}{5}}}$

18. $u^v = w \rightarrow \boxed{\log_u w = v}$

19. $\log_5 25 = \boxed{2}$

20. $\log_4 (\frac{1}{16}) = \boxed{-2}$

21. $\log_5 (x\sqrt{y^3+3}) = \boxed{\log_5 x + \frac{1}{2} \log_5 (y^3+3)}$

22. $\ln (\frac{x}{y^2}) = \boxed{\ln x - 2 \ln y}$

23. $\ln (x-2) - \ln (x+2) = \boxed{\ln (\frac{x-2}{x+2})}$

$$24. 3^4 = 27^{m-1} \rightarrow 3^4 = 3^{3(m-1)} \rightarrow 4 = 3m-3 \rightarrow 7 = 3m \rightarrow \boxed{m = \frac{7}{3}}$$

$$25. 16^{2n+1} = \frac{1}{32} \rightarrow 2^{4(2n+1)} = 2^{-5} \rightarrow 8n+4 = -5 \rightarrow 8n = -9 \rightarrow \boxed{n = -\frac{9}{8}}$$

$$26. \log_4 X = 3 \rightarrow X = 4^3 \rightarrow \boxed{X = 64}$$

$$27. \frac{3 \ln X}{3} = \frac{10}{3} \rightarrow \ln X = \frac{10}{3} \rightarrow \boxed{X = e^{10/3}}$$

$$28. \log x + \log(x+3) = 1 \rightarrow \log(x(x+3)) = 1 \rightarrow x^2 + 3x = 10 \\ \rightarrow x^2 + 3x - 10 = 0 \rightarrow (x+5)(x-2) = 0 \quad x = -5, \boxed{x = 2}$$

$$29. \log(x^2 + 16) = \log(80) \rightarrow x^2 + 16 = 80 \rightarrow \sqrt{x^2} = \sqrt{64} \rightarrow \boxed{x = \pm 8}$$

$$30. \log_3(x) = 2 \log_3 3 + \log_3 5 \rightarrow \log_3(x) = \log_3(3^2 \cdot 5) \rightarrow \boxed{x = 45}$$

$$31. a^2 - 8a - 20 = 0 \quad \boxed{a = -2, 10}$$

$$32. p = 2000 \quad r = .05 \quad t = 18 - 12 = 6 \\ y = 2000 e^{(.05 \times 6)} = \boxed{\$2699.72}$$

$$33. \log_3 8.76 = \frac{\log 8.76}{\log 3} = \boxed{1.975}$$

$$34. 9^{4x} = 25 \rightarrow \log_9(25) = 4x \rightarrow \boxed{x = \frac{1}{4} \left(\frac{\log 25}{\log 9} \right) = .3666}$$

$$35. 7^{x-4} = 8 \rightarrow x-4 = \log_7 8 \rightarrow \boxed{x = \frac{\log 8}{\log 7} + 4 = 5.069}$$

$$36. e^x = 72 \rightarrow \boxed{x = \ln 72 = 4.277}$$