

AFM UNIT 1 REVIEW SHEET

Name: Key

I. Determine which functions show exponential growth or decay. Then find the rate of growth or decay.

1. $y = 5.6(1.23)^x$

2. $y = 0.04(.92)^x$

3. $y = 8.99(1.02)^x$

Growth 23%

Decay 8%

Growth 2%

II. Rewrite as a logarithm:

4. $4^3 = 64$

$\log_4 64 = 3$

5. $10^{-2} = \frac{1}{100}$

$\log \frac{1}{100} = -2$

6. $5^4 = 625$

$\log_5 625 = 4$

III. Rewrite as an exponential equation:

7. $\log_2 16 = 4$

$2^4 = 16$

8. $\log_8 \frac{1}{8} = -1$

$8^{-1} = \frac{1}{8}$

9. $\log .01 = -2$

$10^{-2} = .01$

IV. Expand the expression:

10. $\log_2 3n^3$

$\log_2 3 + \log_2 n^3$

$\log_2 3 + 3\log_2 n$

11. $\log \frac{a^2}{10}$

$\log a^2 - \log 10$

$2\log a - 1$

12. $\log_4(x\sqrt{y})$

$\log_4 x + \log_4 y^{1/2}$

$\log_4 x + \frac{1}{2}\log_4 y$

$\log_4 x + \frac{\log_4 y}{2}$

13. $\ln 4e^2$

$\ln 4 + \ln e^2$

$\ln 4 + 2\ln e$

$\ln 4 + 2$

14. $\log_4 \frac{4x}{y^2}$

$\log_4 4x - \log_4 y^2$

$\log_4 4 + \log_4 x - 2\log_4 y$

$1 + \log_4 x - 2\log_4 y$

15. $\ln(6xy^3)^2$

$2\ln 6xy^3$

$2\ln 6 + 2\ln x + 2\ln y^3$

$2\ln 6 + 2\ln x + 6\ln y$

V. Write as a single logarithm (Condense):

16. $\log 4 + \log 5 - \log 2$

$\log 20 - \log 2$

$\log 10$

1

17. $2\log_4 x - 3\log_4 y$

$\log_4 x^2 - \log_4 y^3$

$\log_4 \frac{x^2}{y^3}$

18. $\log_6 5 + \frac{\log_6 x}{3}$

$\log_6 5 + \frac{1}{3}\log_6 x$

$\log_6 5 + \log_6 x^{1/3}$

$\log_6 5\sqrt[3]{x}$

19. $3\ln x - 2(\ln y + \ln z)$

$3\ln x - 2\ln yz$

$\ln x^3 - \ln(yz)^2$

$\ln \frac{x^3}{(yz)^2}$ or $\ln \frac{x^3}{y^2 z^2}$

20. $2\log_5 3 + \log_5 10 - \log_5 18$

$\log_5 9 + \log_5 10 - \log_5 18$

$\log_5 90 - \log_5 18$

$\log_5 5$

1

VI. Write the following using change of base, then evaluate:

21. $\log_5 9$

$$\frac{\log 9}{\log 5} = 1.36521$$

22. $\log_{11} 9.4$

$$\frac{\log 9.4}{\log 11} = 0.934449$$

23. $\log_6 \frac{1}{2}$

$$\frac{\log \frac{1}{2}}{\log 6} = -0.38685$$

VII. Solve for x: SHOW ALL WORK

24. $3^x = 8$

$$\log_3 8 = x$$

$$x = 1.893$$

25. $9^{2x} = 27^{2x-5}$

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

$$4x = 6x - 15$$

$$-2x = -15$$

$$x = 15/2 \text{ or } 7.5$$

26. $9^{3x-6} = 21$

$$\log_9 21 = 3x - 6$$

$$1.385622 = 3x - 6$$

$$7.385622 = 3x$$

$$x = 2.4619$$

27. $\log x + 4 = 8$

$$\log x = 4$$

$$10^4 = x$$

$$x = 10,000$$

28. $2 \ln x = 3$

$$\ln x = 3/2$$

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

$$x = 4.4817$$

29. $\log_2(x+2) = \log_2(3x-4)$

$$x+2 = 3x-4$$

$$6 = 2x$$

$$x = 3$$

30. $\log x = 2 \log 6 - \log 9$

$$\log x = \log 36 - \log 9$$

$$\log x = \log 4$$

$$x = 4$$

31. $\log_3(x^2 - 25) = 2$

$$3^2 = x^2 - 25$$

$$9 = x^2 - 25$$

$$34 = x^2$$

$$x = \pm 5.83095$$

32. $3^{2x+3} = 4^{x-2}$

$$\log_3 4^{x-2} = 2x+3$$

$$(x-2) \log_3 4 = 2x+3$$

$$(x-2)(1.26186) = 2x+3$$

$$1.26186x - 2.52372 = 2x+3$$

$$-5.52372 = .73814x$$

$$x = -7.4833$$

33. $\log_2(x^2 + 4) = \log_2(6x - 4)$

$$x^2 + 4 = 6x - 4$$

$$x^2 - 6x + 8 = 0$$

$$(x-4)(x-2) = 0$$

$$x = 4$$

$$x = 2$$

34. $\ln(2x+1) - \ln(3) = 2$

$$\ln \frac{2x+1}{3} = 2$$

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

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

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

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

$$x = 10.5836$$

35. $2e^{3x} = 18$

$$e^{3x} = 9$$

$$\ln 9 = 3x$$

$$\frac{\ln 9}{3} = x$$

$$x = .7324$$

treat it as:

36. $\ln^2 x^2 - \ln x^{10} = 28$

$2 \ln^2 x - 10 \ln x - 28 = 0$

$2(\ln x - 7)(\ln x + 2) = 0$

$\ln x - 7 = 0$

$\ln x = 7$

$x = e^7$

$\ln x + 2 = 0$

$\ln x = -2$

$x = e^{-2}$

$x = 1096.6332$

$x = .1353$

treat it as:

37. $e^{2x} - e^x - 30 = 0$

$(e^x - 6)(e^x + 5) = 0$

$e^x - 6 = 0$ $e^x + 5 = 0$

$e^x = 6$ $e^x = -5$

$x = \ln 6$ $x = \ln -5$

$x = 1.7918$

38. $-e^{2x} - 5 = -18$

$-e^{2x} = -13$

$e^{2x} = 13$

$\ln 13 = 2x$

$\frac{\ln 13}{2} = x$

$x = 1.2825$

VIII. Write an exponential model for each problem and solve:

39. Ms. Norris buys a condo at the beach for \$195,000. The condo's value increases at a rate of 13.2% per year.
a) Find the value of the condo after 6 years.

$y = 195,000(1.132)^5$

$\$410,311.01$

B) When will the condo be worth \$500,000?

$500,000 = 195,000(1.132)^x$

$100/39 = 1.132^x$

$\log_{1.132} 100/39 = x$

$x \sim 7.6$
yrs

40. Mrs. Carroll buys a new RV worth \$56,000 to take her family on a trip around the country. The RV depreciates at a rate of 21% per year. She plans to keep the RV for 5 years and then sell it. What will the RV be worth when Mrs. Carroll sells it?

$y = 56,000(.79)^5$

$\$17,231.52$

41. A piece of furniture valued at \$25,000 depreciates at a steady rate of 10% annually. In how many years will it be worth \$5000?

$5000 = 25000(.90)^x$

$\frac{1}{5} = .90^x$

$\log_{.90} 1/5 = x$

$x \sim 15.3$
yrs

42. You bought a car for \$22,000 that's value decreases 12% each year. When it be worth half its original value?

$11,000 = 22,000(.88)^x$

$\frac{1}{2} = .88^x$

$\log_{.88} 1/2 = x$

$x \sim 5.4$
yrs

43. 5 years ago Mrs. Murphy bought an antique. It's now valued at \$82.28, and its value increases 8% each year. How much did Mrs. Murphy originally pay for the antique?

$82.28 = x(1.08)^5$

$82.28 = x(1.4693)$

$x = \frac{82.28}{1.4693}$

$x = \$56$

44. Find the accumulated amount in your bank account if you deposit \$1,250.00 in an account paying 8% interest compounded weekly for 5 years.

$$A = P \left(1 + \frac{r}{n}\right)^{nt}$$

$$A = 1250 \left(1 + \frac{.08}{52}\right)^{52 \cdot 5}$$

$$\boxed{\$1864.21}$$

45. If you invest \$5000, compounded semiannually, and have \$6850 after 6 years, what rate of interest did you earn?

$$A = P \left(1 + \frac{r}{n}\right)^{nt}$$

$$6850 = 5000 \left(1 + \frac{r}{2}\right)^{2 \cdot 6}$$

$$1.37 = \left(1 + \frac{r}{2}\right)^{12}$$

$$1.02658 = 1 + r/2$$

$$.02658 = r/2$$

$$.05316 = r$$

$$\boxed{r \sim 5.37\%}$$

46. How long will it take to triple your money in an account paying $5\frac{3}{4}\%$ interest compounded quarterly?

$$A = P \left(1 + \frac{r}{n}\right)^{nt}$$

$$3 = 1 \left(1 + \frac{.0575}{4}\right)^{4t}$$

$$3 = (1.014375)^{4t}$$

$$\log 1.014375 \cdot 3 = 4t$$

$$t \sim 19 \text{ yrs}$$

47. Mike deposits \$800 in an account that pays 10.6%, compounded continuously. In how many years will the balance be \$1150?

$$A = Pe^{rt}$$

$$1150 = 800e^{.106t}$$

$$1.4375 = e^{.106t}$$

$$\ln 1.4375 = .106t$$

$$t \sim 3.4 \text{ yrs}$$

48. Two brothers, Bobby and John, each deposit \$200 in a savings account. Bobby's account pays 7% annual interest compounded annually. John's account pays 7% compounded quarterly. Which brother has a larger balance by the end of the year? By how much?

Bobby $A = 200 \left(1 + \frac{.07}{1}\right)^{1 \cdot 1}$ $A = 200(1.07)$ $A = \$214$

John $A = 200 \left(1 + \frac{.07}{4}\right)^{4 \cdot 1}$ $A = 200(1.0175)^4$ $A = \$214.37$

$$\boxed{\text{John has more by } 37\text{¢}}$$

49. Find the amount in an account after 15 years if \$5000 was initially invested and the account earns 8% annual interest compounded quarterly.

$$A = P \left(1 + \frac{r}{n}\right)^{nt}$$

$$A = 5000 \left(1 + \frac{.08}{4}\right)^{4 \cdot 15}$$

$$A = 5000(1.02)^{60}$$

$$\boxed{A = \$16,405.15}$$