Algebra 2 Chapter 6 Review Name Key

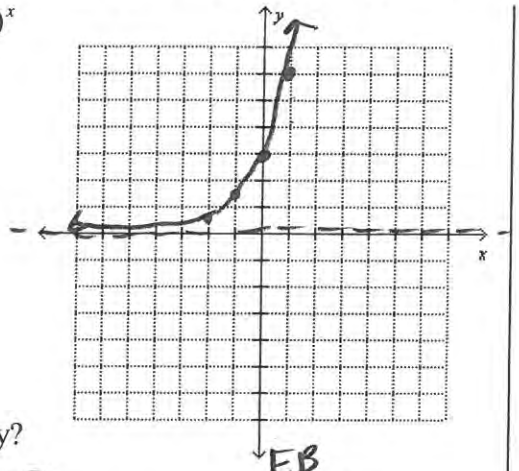
NO graph calculator. Period ____ Date ____

All work must be present to receive any credit.

#1-4 Sketch the graph using at least 3 points and complete the information.

1. $y = 3(2)^x$

x	y
-2	3/4
-1	3/2
0	3
1	6
2	12



Growth or Decay?

Asymptote $y = 0$

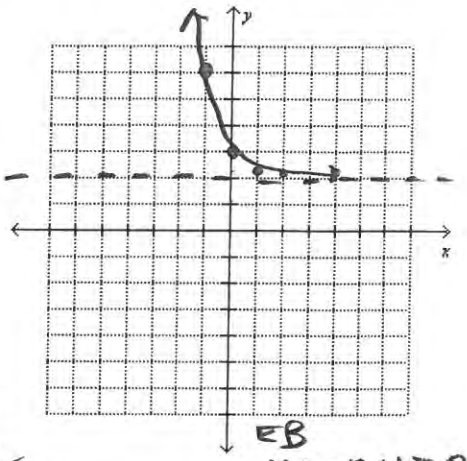
y-intercept $(0, 3)$

Domain: $(-\infty, \infty)$

Range: $(0, \infty)$

2. $y = (\frac{1}{4})^x + 2$

x	y
-2	18
-1	6
0	3
1	2 1/4
2	2 1/16



Growth or Decay?

Asymptote $y = 2$

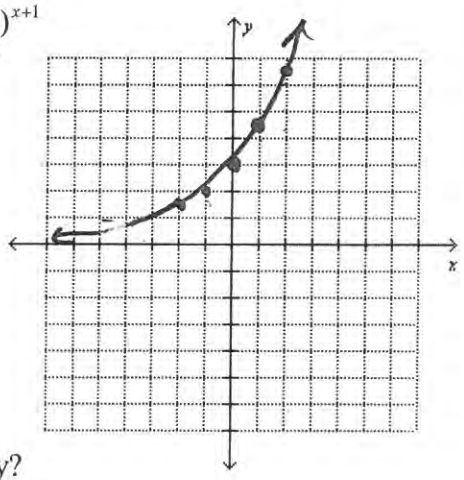
y-intercept $(0, 3)$

Domain: $(-\infty, \infty)$

Range: $(2, \infty)$

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

x	y
-2	1 1/3
-1	2
0	3
1	4 1/2
2	27/4



Growth or Decay?

Asymptote $y = 0$

y-intercept $(0, 3)$

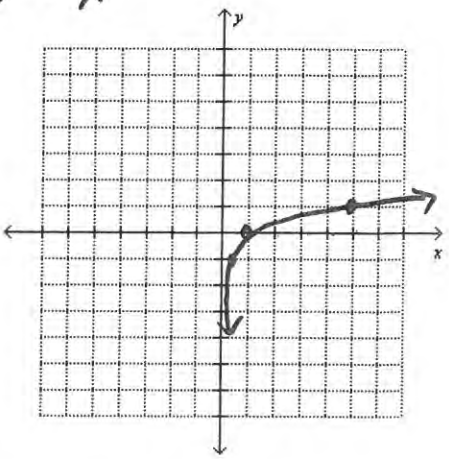
Domain: $(-\infty, \infty)$

Range: $(0, \infty)$

End Behavior $x \to -\infty$ $y \to 0$
$x \to \infty$ $y \to \infty$

4. $y = \log_5 x$ $\quad 5^y = x$

x	y
1/5	-1
1	0
5	1
25	2



Asymptote $x = 0$

x-intercept $(1, 0)$

Domain: $(0, \infty)$

Range: $(-\infty, \infty)$

End Behavior $x \to 0$ $y \to -\infty$
$x \to \infty$ $y \to \infty$

5. Write the equations in exponential form.

a. $\log_8 \frac{1}{64} = -2$

$8^{-2} = \frac{1}{64}$

b. $\log_e (x-2) = 4$

$e^4 = x-2$

6. Write the equations in logarithmic form.

a. $6^3 = 216$

$\log_6 216 = 3$

b. $2^{4x} = 8$

$\log_2 8 = 4x$

#7-10 Evaluate.

7. $\log_2 32 = \boxed{5}$

$2^x = 32$

8. $\log_3 \frac{1}{81} = \boxed{-4}$

$3^x = \frac{1}{81}$

$\frac{1}{3^4} = 3^{-4}$

9. $\log_{125} 5 = \boxed{1/3}$

$125^x = 5$ or $(5^3)^x = 5^1$

$\sqrt[3]{125} = 5$ $3x = 1$

$x = 1/3$

10. $\log_8 2 = \boxed{1/3}$

$8^x = 2$ or $(2^3)^x = 2^1$

$\sqrt[3]{8} = 2$ $3x = 1$

$x = 1/3$

Condense the log.

11. *a.* $\log_4 2y + \log_4 6$ multiply

$\boxed{\log_4 12y}$

b. $2\log_3 y - 2\log_3 x$

$\log_3 y^2 - \log_3 x^2$

$\boxed{\log_3 \frac{y^2}{x^2}}$

c. $2\log_5 3 + 2\log_5 (4x) - \log_5 4x$

$\log_5 9 + \log_5 16x^2 - \log_5 4x$

$\log_5 144x^2 - \log_5 4x$

$\log_5 \frac{144x^2}{4x}$

$\boxed{\log_5 36x}$

Expand the log.

12. *a.* $\log_5 x^3 y^5$

$\log_5 x^3 + \log_5 y^5$

$3\log_5 x + 5\log_5 y$

b. $\log_5 \frac{3x^2}{y}$

$\log_5 3x^2 - \log_5 y$

$\log_5 3 + \log_5 x^2 - \log_5 y$

$\log_5 3 + 2\log_5 x - \log_5 y$

#13-26 Solve. Be sure to check for extraneous solutions. Round decimal answers to nearest thousandth. Be sure to check for extraneous solutions.

13. $32^x = 8^{x+3}$

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

$5x = 3x+9$

$2x = 9$

$\boxed{x = 9/2}$

14. $4^{x+4} = 2^{x-4}$

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

$2x+8 = x-4$

$\boxed{x = -12}$

15. $\log_{26}(x^2+1) = 1$

$26^1 = x^2+1$

$25 = x^2$

$\boxed{\pm 5 = x}$

x^2+1

$5^2+1 = 26$ ✓

$(-5)^2+1 = 26$

16. $\log_{11} x = 2$

$11^2 = x$

$\boxed{121 = x}$

17. $2\log_2 x - \log_2(x+3) = 2$

$x > -3$

$x > 0$

$\log_2 x^2 - \log_2(x+3) = 2$

$\log_2 \frac{x^2}{x+3} = 2$

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

$\frac{4}{1} = \frac{x^2}{x+3}$

$4x+12 = x^2$

$x^2-4x-12 = 0$

$(x-6)(x+2) = 0$

$\boxed{x = 6}$ $x \neq -2$

18. $\log_6 x + \log_6(x-5) = 2$

$x > 0$

$x > 5$

$\log_6(x^2-5x) = 2$

$6^2 = x^2-5x$

$0 = x^2-5x-36$

$0 = (x-9)(x+4)$

$\boxed{x = 9}$ $x \neq -4$

19. $\ln x + \ln 3x = 12$

$\ln 3x^2 = 12$

$e^{12} = 3x^2$

$\frac{e^{12}}{3} = x^2$

$\pm \frac{e^6}{\sqrt{3}} = x$ $x = \frac{e^6}{\sqrt{3}}$ or $\boxed{232.920}$

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

$x > 0$

$\log_{10} 8x = 2$

$10^2 = 8x$

$100 = 8x$

$\boxed{\frac{25}{2} = x}$

21. $\log_2(4y-10) = \log_2(y-1)$

$y > 1$

$y > 5/2$

$4y-10 = y-1$

$3y = 9$

$\boxed{y = 3}$

22. $\ln(x-7) = 2$

$x > 7$

$e^2 = x-7$

$e^2+7 = x$

$\boxed{\text{or } 14.389}$

23. $4^{3p} = 10$

$\log 4^{3p} = \log 10$

$3p \log 4 = 1$

$3p(0.602) = 1$

$1.806p = 1$

$\boxed{p = 0.554}$

24. $2.1^{t-5} = 9.32$

$\log 2.1^{t-5} = \log 9.32$

$(t-5)\log 2.1 = \log 9.32$

$(t-5)(.322) = .969$

$.322t - 1.61 = .969$

$.322t = 2.579$

$\boxed{t \approx 8.009}$

25. $3e^x + 1 = 5$

$3e^x = 4$

$e^x = 4/3$

$\ln e^x = \ln 4/3$

$x = \ln 4/3$

$\boxed{x \approx 0.288}$

26. $7^{p+2} = 13^{5-p}$

$\log 7^{p+2} = \log 13^{5-p}$

$(p+2)\log 7 = (5-p)\log 13$

$(.845)(p+2) = 1.114(5-p)$

$1.69 + .845p = 5.570 - 1.114p$

$.845p = 3.88 - 1.114p$

$1.959p = 3.88$

$\boxed{p = 1.981}$

#27-32 Evaluate.

27. e^4

54.598

28. $\ln 3$

1.099

29. $\log 10^{2x}$

$\log_{10} 10^{2x}$

$2x$

30. $\ln e^4$

$\ln e^4$

4

31. $\log_5 20$

$\frac{\log 20}{\log 5} \approx 1.861$

or $\frac{\ln 20}{\ln 5}$

32. $\log_3 8$

$\frac{\log 8}{\log 3} \approx 1.893$

or $\frac{\ln 8}{\ln 3}$

Solve the following scenarios. Be sure to show all of your work.

33. Suppose a Zombie virus has infected 40 people at our school. The number of zombies doubles every hour. Write an equation that models this.

$y = 40(2)^x$ x = # hours

How many zombies are there after 3 hours?

$y = 40(2)^3 = 320$ zombies!!

34. Suppose a Zombie virus has infected 40 people at our school and turned them into zombies. The number of zombies increases by **exactly** 25% every hour. Write an equation that models this.

$y = 40(1+.25)^x$

$y = 40(1.25)^x$

How many zombies are there after 3 hours?

$y = 40(1.25)^3 = 78.125$

78 zombies!!

35. Using your equation from #2, when will there be 1000 zombies to take over the school?

$1000 = 40(1.25)^x$

$\frac{1000}{40} = 1.25^x$

$25 = 1.25^x$

$\log 25 = \log 1.25^x$

$\log 25 = x \log 1.25$

$\frac{\log 25}{\log 1.25} = x$

$14.412 = x$ hours

36. A Bacteria culture doubles in size every 8 hours. The culture starts at 430 cells.

t = 8 hours increments

$y = 430(2)^x$

x is hours

How many will there be after 24 hours? After 72 hours?

or $y = 430(2)^{x/8}$

$y = 430(2)^3$

$= 3440$ bacteria

$y = 430(2)^9 = 220{,}160$ bacteria

37. A dish has 212 bacteria in it. The population of bacteria will grow by 80% every day. How many bacteria will be present in 4 days?

$y = 212(1.80)^t$

$y = 212(1.80)^4 = 2225.491$ bacteria

38. The house down the street has termites in the porch. The exterminator estimated that there are about 800,000 termites eating at the porch. He said that the treatment he put on the wood would kill 40% of the termites every day.

How many termites will be eating at the porch in 3 days? t

$y = 800{,}000(1-.40)^t$

$y = 800{,}000(.6)^3 = 172{,}800$ termites

39. Your baby brother has an ear infection. The doctor said there are probably 50,000,000 bacteria in his left ear. The penicillin the doctor prescribed will kill 7% of the bacteria every 6 hours.

$y = 50{,}000{,}000(1-.07)^x$ x = 6hr increments

How many bacteria will be in your brother's ear in 5 days? $y = 50{,}000{,}000(.93)^{20} = 11{,}711{,}943.$ bacteria

$5 \times 24 = 120$ hrs

$\div 6 = 20$ increments.

When will your baby brother have 1 bacteria left?

$1 = 50{,}000{,}000(0.93)^x$

$\log \frac{1}{50{,}000{,}000} = x \log .93$ $x = 244.280$ (6hr increments)

1465.677 hrs or 61.070 days

40. A diamond ring was purchased twenty years ago for \$500. The value of the ring increased by 8% each year. What is the value of the ring today?

$y = 500(1.08)^{20} \approx \$2330.48$

Compound Interest: $A = P(1+\frac{r}{n})^{nt}$ $A = Pe^{rt}$

41. Find the balance of a checking account that has \$600 compounded at 4% for 5 years.

Semiannually: $A = 600(1+\frac{.04}{2})^{10} \approx \$731.40$

Monthly: $A = 600(1+\frac{.04}{12})^{60} \approx \$732.60$

When will it reach \$1000 (monthly)? $1000 = 600(1+\frac{.04}{12})^{12t}$

$\frac{5}{3} = (1+\frac{.04}{12})^{12t}$

$\log 5/3 = 12t \log(1+\frac{.04}{12})$

$\frac{\log 5/3}{12 \log(1+\frac{.04}{12})} = 12.79$ years

42. Find the balance of a checking account that has \$5,000 compounded **continuously** at 16% for 10 years.

$A = 5000e^{.16 \cdot 10} \approx \$24{,}765.16$

When will it double in value?

$10000 = 5000e^{.16t}$

$2 = e^{.16t}$

$\ln 2 = \ln e^{.16t}$

$\ln 2 = .16t$

4.33 yrs $\approx \ln 2 / .16 \approx t$