Algebra 2 Honors
WS: 4.1, 4.3, 4.4 Review

2017-18

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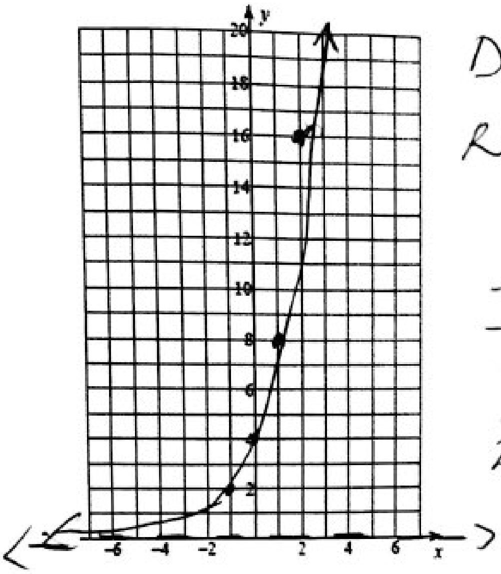
Date 5/4, 5/5 Block 1B, 4A

In 1 – 2, tell whether the function represents exponential growth or decay. Graph the function and state its domain and range. Include a table showing the points used to make your graph.

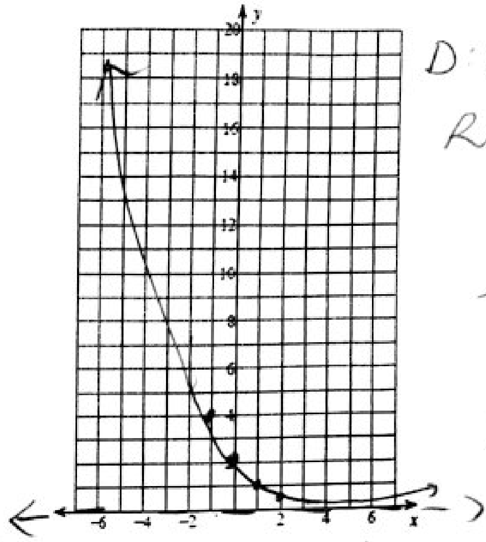
1. $f(x) = 4 \cdot 2^x$ Growth



D: $(-\infty, \infty)$
R: $(0, \infty)$

x	f(x)
-1	2
0	4
1	8
2	16

2. $f(x) = 2\left(\frac{1}{2}\right)^x$ Decay



D: $(-\infty, \infty)$
R: $(0, \infty)$

x	f(x)
-1	4
0	2
1	1
2	1/2

Make sure you include the asymptote!

3. Since January 1980, the population of the city of Brownville has grown according to the mathematical model $f(x) = 720{,}500(1.022)^x$, where x is the number of years since January 1980.
   a. Explain what the numbers 720,500 and 1.022 represent in this model.

   720,500 was the population of Brownville in January of 1980
   1.022 is the growth factor. The population is increasing at a rate of 2.2%/year.

   b. What would the population be in 2000 if the growth continues at the same rate?

   $f(20) = 720{,}500(1.022)^{20} = \boxed{1{,}113{,}401.}754$

   c. Use your graphing calculator to predict when the population of Brownville will first reach 1,000,000.

   Find point of intersection of $y = 1{,}000{,}000$ and $y = 720500(1.022)^x$. after 15.06 years

4. Your new computer cost $1500 but it depreciates in value by about 18% each year.
   a. Write an equation that would indicate the value of the computer after x years.

   $f(x) = 1500(0.82)^x$

   b. How much will your computer be worth in 6 years?

   $f(6) = 1500(0.82)^6 = \$456.01$

   c. About how long will it take before your computer is worth close to zero dollars, according to your equation?

   Find point of intersection of
   because the exponential function will never = 0 →
   $y = 0.01$, $y = 1500(0.82)^x$
   About 60.06 years

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In 5 – 8, rewrite each equation in exponential form.

5. $\log_6 36 = 2$ $\quad 6^2 = 36$

7. $\log_u \frac{15}{16} = v$ $\quad u^v = \frac{15}{16}$

6. $\log_{14} \frac{1}{196} = -2$ $\quad 14^{-2} = \frac{1}{196}$

8. $\log_u v = -16$ $\quad u^{-16} = v$

In 9 - 12, rewrite each equation in logarithmic form.

9. $64^{1/2} = 8$ $\quad \log_{64} 8 = 1/2$

11. $u^{-14} = v$ $\quad \log_u v = -14$

10. $9^{-2} = \frac{1}{81}$ $\quad \log_9 \frac{1}{81} = -2$

12. $9^y = x$ $\quad \log_9 x = y$

In 13 – 26, evaluate. NO CALCULATORS!

13. $\log_4 64 = 3$

14. $\log_6 216 = 3$

15. $\log_4 16 = 2$

16. $\log_3 \frac{1}{243} = -5$

17. $\log_5 125 = 3$

18. $\log_2 4 = 2$

19. $\log_{343} 7 = 1/3$

20. $\log_8 4 = 2/3 \leftarrow \left(\frac{\log_2 4}{\log_2 8}\right)$

21. $\log_{64} 4 = 1/3$

22. $\log_6 \frac{1}{216} = -3$

23. $12^{\log_{12} 144} = 144$

24. $5^{\log_5 17} = 17$

25. $x^{\log_x 72} = 72$

26. $9^{\log_3 20}$

$3^{2(\log_3 20)}$

$3^{\log_3 20^2} = 20^2 = 400$

In 27 – 32, expand each logarithm.

27. $\log(6 \cdot 11)$ $\quad \log 6 + \log 11$

30. $\log \frac{x}{y^6}$ $\quad \log x - 6 \log y$

28. $\log\left(\frac{6}{11}\right)^5$ $\quad 5 \log\left(\frac{6}{11}\right)$

$5 \log 6 - 5 \log 11$

31. $\log \sqrt[3]{xyz} = \log (xyz)^{1/3}$

$= \frac{1}{3} \log x + \frac{1}{3} \log y + \frac{1}{3} \log z$

29. $\log \frac{2^4}{5}$ $\quad 4 \log 2 - \log 5$

32. $\log \frac{u^4}{v} = 4 \log u - \log v$

In 33 – 40, condense each expression to a single logarithm.

33. $\log 3 - \log 8$ $\quad \log \frac{3}{8}$

35. $\log \frac{7}{12^2}$ oops! already a single logarithm

34. $4 \log 3 - 4 \log 8$ $\quad \log \left(\frac{3}{8}\right)^4$

36. $6 \log_3 u + 6 \log_3 v$ $\quad \log_3 (uv)^6$

37. $\log_4 u - 6\log_4 v$ $\log_4 \frac{u}{v^6}$

39. $\log x - 4\log y$ $\log \frac{x}{y^4}$

38. $20\log_6 u + 5\log_6 v$ $\log_6 u^{20}v^5$

40. $2(\log 2x - \log y) - (\log 3 + 2\log 5)$

$2\left(\log \frac{2x}{y}\right) - \log 3 \cdot 5^2 =$

$\log \frac{4x^2}{y^2} - \log 75$

$\boxed{\log \frac{4x^2}{75y^2}}$

In 41 – 44, use the change of base formula to evaluate. Work must be shown!

41. $\log_2 8.7$ $= \frac{\log 8.7}{\log 2} = 3.121$

43. $\log_{12} 3$ $\frac{\log 3}{\log 12} = 0.442$

42. $\log_{13} 194$ $= \frac{\log 194}{\log 13} = 2.054$

44. $\log_3 62$ $= \frac{\log 62}{\log 3} = 3.757$