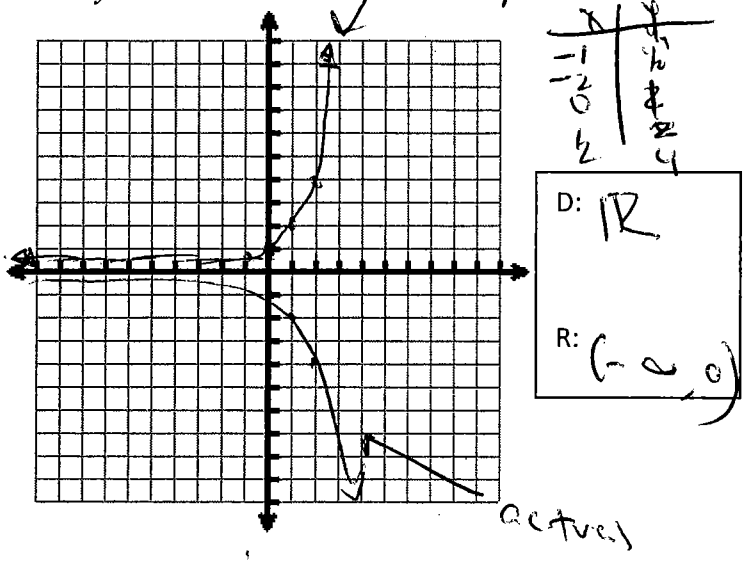
Algebra 2
8.1 – 8.6 Review

Name Key Hour _____

Graph. Show and label any asymptotes. Give Domain and Range of each. It would help to graph the parent.

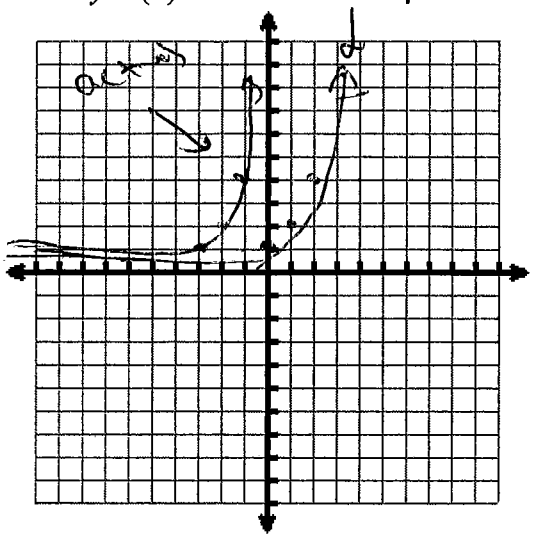
1. $y = -2^x$



D: $\mathbb{R}$

R: $(-\infty, 0)$

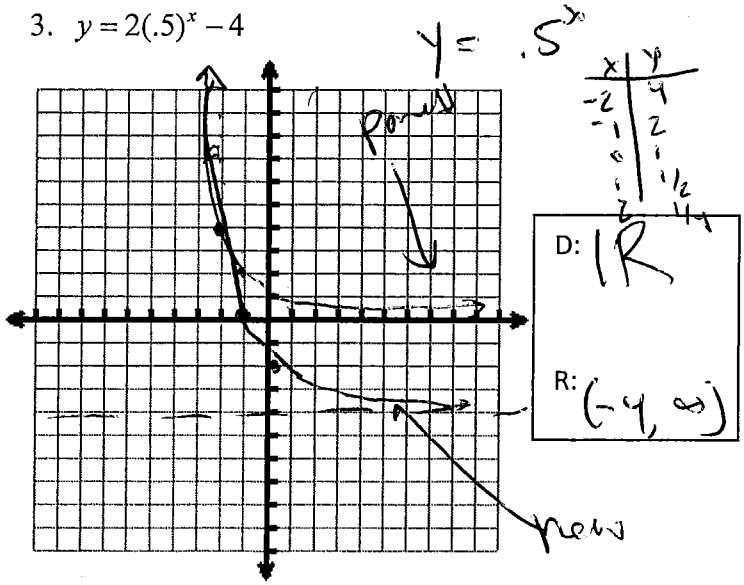
2. $y = (2)^{x+3}$



D: $\mathbb{R}$

R: $(0, \infty)$

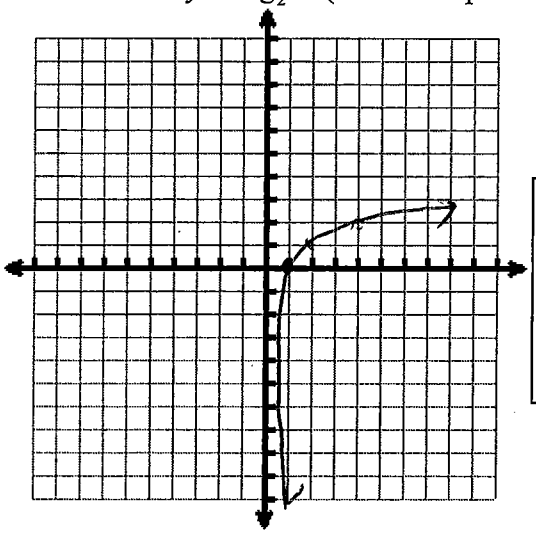
3. $y = 2(.5)^x - 4$



D: $\mathbb{R}$

R: $(-4, \infty)$

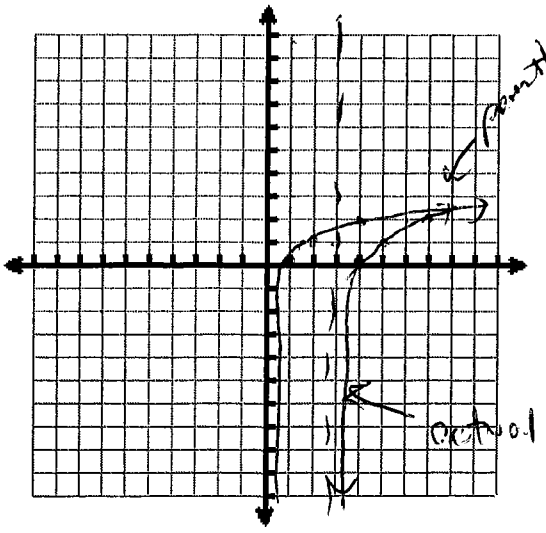
4. $y = \log_2 x$ (this is the parent for #6 & #7)



D: $(0, \infty)$

R: $\mathbb{R}$

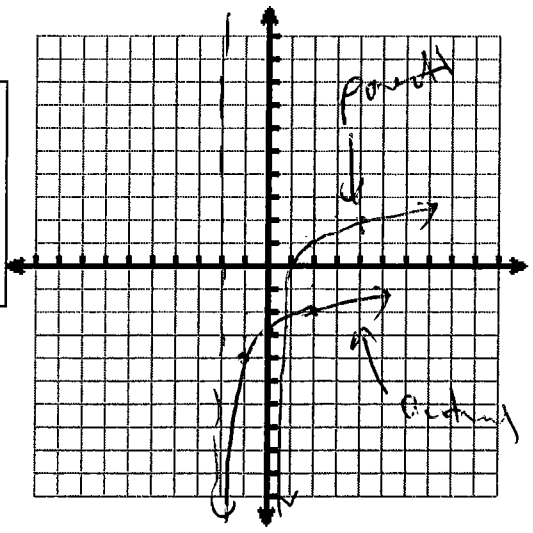
6. $f(x) = \log_2 (x-3)$



D: $(3, \infty)$

R: $\mathbb{R}$

7. $f(x) = \log_2 (x+2) - 4$



D: $(-2, \infty)$

R: $\mathbb{R}$

Solve.

8. The population of the United States in 2010 was about 308 million with an average annual rate of increase of about 2%. Write an exponential function to model this situation. What will the population be in 2050?

$y = 308(1.02)^{40} =$

9. Write an exponential function for a graph that includes the points (1, 6) and (0, 2).

$\frac{2}{3}, \frac{6}{1}$ $\quad y = 2(3)^x$

10. The population of mosquitoes grows exponentially. While doing some research on them, I collected some in a tube and after 1 day I counted 3, but after 4 days, I counted 10 mosquitoes. Write an exponential function for this situation.

(1, 3) (4, 10) → calculator → $y = 2(1.5)^x$

11. Using the fact that the element Gandalfadorium has a half-life of 6 hours, find the amount of Gandalfadorium that remains from a 60 mg supply after 20 hours.

$Y = 60\left(\frac{1}{2}\right)^{20/6} =$ 5.95 mg

12. Suppose you invest \$100 at an annual interest rate of 4.8% compounded continuously. How much will you have in the account after three years? How long will it take to have ~~\$200 in your account~~?

~~100~~ → $A = 100e^{.048 \times 3}$

$A = 115.49$

$200 = 100e^{.048t}$

$2 = e^{.048t}$

$\log_e 2 = .048t$

$t = 14.44$

Write each equation in logarithmic form.

13. $3^4 = 81$ $\quad \log_3 81 = 4$

14. $10^{-2} = 0.01$ $\quad \log_{10} .01 = -2$

15. $2^{-4} = \frac{1}{16}$ $\quad \log_2 \frac{1}{16} = -4$

Evaluate each logarithm without using a calculator.

16. $\log_3 81 = x$

$3^x = 81$

$x = 4$

17. $\log_4 1$

$4^x = 1$

$x = 0$

18. $\log 10000$

$10^x = 10{,}000$

$x = 4$

19. $\log_2\left(\frac{1}{64}\right)$

$2^x = \frac{1}{64}$

$x = -6$

20. A computer valued at $6500 depreciates at the rate of 14% per year.

a. Write a function that models the value of the computer.

$y = 6500(.86)^x$

b. Find the ~~value of the computer~~ after 3 years.

$4134.36

c. When will the computer be worth less than $1500?

$1500 = 6500(.86)^x$

$.23 = .86^x$

$\log_{.86} .23 = x$

$x = 9.74$ yrs

Solve each equation. Show all work. You may need to condense multiple logs down to one log.

21. $2\log x - \log 4 = 2$

$\log \frac{x^2}{4} = 2$

$10^2 = \frac{x^2}{4}$

$100 = \frac{x^2}{4}$

$400 = x^2$

$\pm 20 = x$

22. $\frac{2\log(2x+5)}{2} = \frac{4}{2}$

$\log(2x+5) = 2$

$10^2 = 2x+5$

$100 = 2x+5$

$47.5 = x$

23. $e^{2n-5} = 500$

$\log_e 500 = 2n-5$

$n = 5.61$

24. $-7 + \log 2x = 4$

$\log 2x = 11$

$10^{11} = 2x$

$x = 50{,}000{,}000{,}000$

25. $5^{2x} = 20$

$\log_5 20 = 2x$

$x = .93$

26. $\log_3 \frac{2x}{41} = 2$

$3^2 = \frac{2x}{41}$

$x = 184.5$

27. $3^{x+2} - 4 = 12$

$3^{x+2} = 16$

$\log_3 16 = x+2$

$x = .52$

28. $\ln(x-5) = 15$

$\log_e (x-5) = 15$

$e^{15} = x-5$

$x = 3{,}269{,}022.31$

Expand each log into multiple logs.

29. $\log\sqrt{\frac{2x}{y}}$

$\log\left(\frac{2x}{y}\right)^{1/2}$

$\frac{1}{2}\log 2 + \frac{1}{2}\log x - \frac{1}{2}\log y$

30. $\log_4 \frac{x^5y^7}{z^4w^4}$

$(5\log_4 x + 7\log_4 y) - (\log_4 z + 4\log_4 w)$

31. $\log_7 \frac{9}{s^2t^{\frac{1}{3}}}$

$\log_7 9 - (2\log_7 s + \frac{1}{3}\log_7 t)$

Write as a single logarithm.

32. $3\log_2 2 - \log_2 4$

$\log \frac{2^3}{4}$

$\log_2 2$

33. $\frac{1}{4}\ln 2 + \frac{1}{4}\ln x$

$\ln 2^{1/4} \cdot x^{1/4}$

$\ln (2x)^{1/4}$

34. $2\log_4 x + \log_4 n - \log_4 p$

$\log_4 x^2 n - \log_4 p$

$\log_4 \frac{x^2 n}{p}$

35. Diego decided to invest his \$500 tax refund rather than spending it. He found a bank that would pay him 4% interest, compounded continuously. If he deposits the entire \$500 and does not deposit or withdraw any other amount, when will he have \$2000?

$2000 = 500e^{.04t}$

$4 = e^{.04t}$

$\log_e 4 = .04t$

$t = 34.66$ yrs

38. The half-life of carbon-14 is known to be 5720 years. Doctor Frankenstein has 300 grams of carbon-14 in his experimental laboratory. If untouched, how long would it take until there is only 200 grams left?

$200 = 300\left(\frac{1}{2}\right)^{x/5720}$

$\frac{2}{3} = \left(\frac{1}{2}\right)^{x/5720}$

$\log_{1/2} \frac{2}{3} = \frac{x}{5720}$

$x = 3345.99$ yrs

39. How long would it take money to triple, if compounded continuously at 5%?

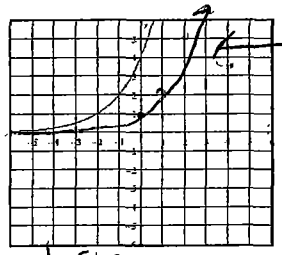
$\frac{3}{1} = \frac{1e^{.05t}}{1}$

$\log_e 3 = .05t$

$t = 21.97$ yrs

40. Find the equation of each exponential function, $g(x)$, whose graph is shown. Each graph involves one or more transformation of the graph of $f(x) = 2^x$

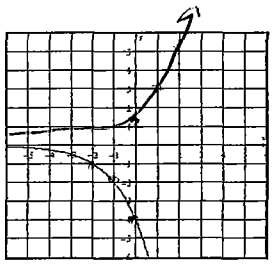
(a)



left 2

$y = 2^{x+2}$

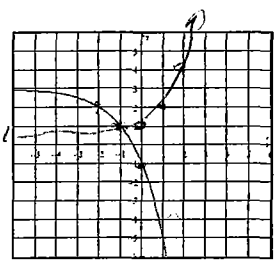
(b)



flipped & left 2

$y = -2^{x+2}$

(c)



flipped, left 2, up 3

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