Chapter 12

Graphing Exponential and Logarithm Functions

REVIEW

Name Key

Date _____ **Hour** _____

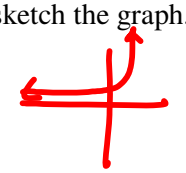
1. Determine whether each function represents exponential growth or exponential decay justify your answer

a. $m(x) = \frac{1}{5}^x$ Decay; $0<r<1$

b. $n(x) = 7.8^x$ Growth; $r>1$

c. $p(x) = \frac{8^{-x}}{9} = \frac{9}{8}^x$ Growth; $r>1$

2. Identify the characteristics of the graph of the function $g(x) = 8^x$. (You might want to sketch the graph.)



a. Asymptotes: $y=0$

b. Intercepts: $(0,1)$

c. End behavior: $\lim_{x\to-\infty} g(x)=0$ $\lim_{x\to\infty} g(x)=\infty$

Complete the following word problems, helpful formulas are given be sure to include labels and round appropriately.

$A(t) = A_o\left(\frac{1}{2}\right)^{\frac{t}{h}}$ $A(t) = P\left(1+\frac{r}{n}\right)^{nt}$ $N(t) = N_0 e^{rt}$

3. The population of a city in 2000 was 28,500 people. Since then, the population has increased at a rate of 2.3% each year.

a. Write a function that describes the population as a function of the number of years, *t*, since 2000.

$N(t) = 28{,}500e^{.023t}$

b. If the rate of population growth remains the same, how many people will live in the city in 2020?

$N(20) = 28{,}500\, e^{.023(20)}$ 45,146 people

4. Potassium-42 has a half-life of 12.4 hours. The initial amount of potassium-42 is 848 grams.

a. Write the half-life functions for Potassium-42. $A(t) = 848\left(\frac{1}{2}\right)^{\frac{t}{12.4}}$

b. Predict the amount of Potassium-42 remaining after 62 hours.

$A(62) = 848\left(\frac{1}{2}\right)^{\frac{62}{12.4}} = 26.5$ g of Potassium-42

5. A club deposits $10,000 into an account that compounds interest quarterly at a rate of 4%.

a. Write an equation that can be used to predict the amount of money in the account over a period of time, *t*.

$A(t) = 10000\left(1+\frac{.04}{4}\right)^{4t}$

b. Predict how much money the group will have at the end of 10 years.

$A(10) = 10000\left(1+\frac{.04}{4}\right)^{4(10)} = \$14{,}888.64$

6. John left for college with $1,300 in his checking account. The table describes how the amount of money decreases at a steady rate after time, *t* weeks.

$\frac{1170}{1300} = .9$

Time (weeks)	A(t), Money in account ($)
0	1,300
1	1,170
2	1,053
3	948
4	853

a. Write an equation that describe the amount of money $A(t)$ after *t* weeks.

$A(t) =$ $1300(.9)^t$

b. Calculate the amount of money in the account after 18 weeks.

$A(18) = 1300(.9)^{18} = \$195.12$

7. Describe the transformation on the function $r(x) = \log_6(x)$:

a. $p(x) = \log_6(-x) + 6$

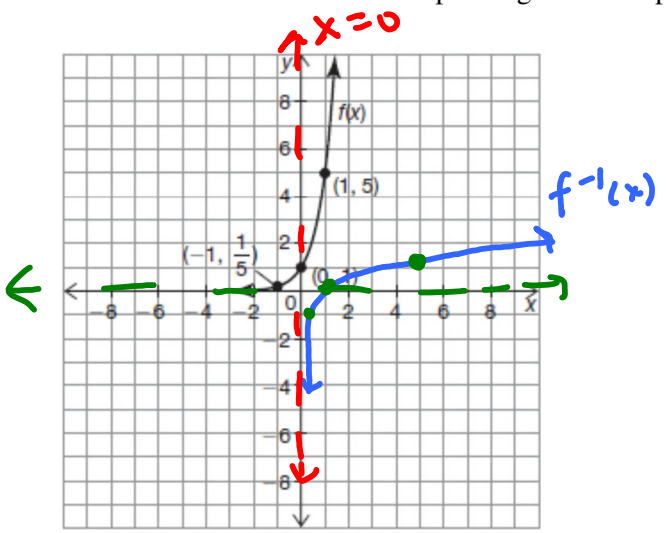
r(x) is reflected over the y-axis, then translated vertically 6 units up to get p(x)

b. $g(x) = -\log_6(x - 4)$

r(x) is reflected over the x-axis, then translated horizontally 4 units to the right.

8. The graph of the function $f(x)$ is shown.

a. Draw a graph of the inverse function, $f^{-1}(x)$, on the same coordinate grid. Show the three corresponding reference points on your graph.



b. Write an equation for the function $f^{-1}(x)$.

$f^{-1}(x) = \log_5(x)$

c. What are the asymptotes for $f(x)$ and $f^{-1}(x)$?

$f(x)$: $y = 0$ $f^{-1}(x)$: $x = 0$

9. Identify the characteristics of the graph of the function $f(x) = \log(-x) + 5$. (You might want to sketch the graph.)

a. Domain: $(-\infty, 0)$

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

c. Asymptotes: $x = 0$

d. Interval of Increasing or Decreasing: $(-\infty, 0)$

e. End behavior: $\lim_{x \to -\infty} f(x) = +\infty$

f. Asymptotic behavior: $\lim_{x \to 0^-} f(x) = -\infty$

10. Identify the characteristics of the graph of the function $g(x) = \ln(x)$. (You might want to sketch the graph.)

a. Domain: $(0, \infty)$

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

c. Asymptotes: $x = 0$

d. Intercepts: $(1, 0)$

e. End behavior: $\lim_{x \to \infty} g(x) = \infty$

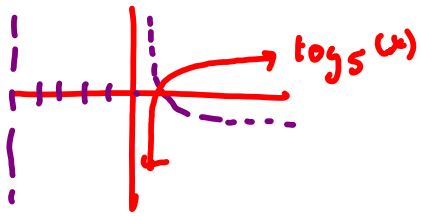
f. Asymptotic behavior $\lim_{x \to 0^+} g(x) = \infty$

11. Identify the characteristics of the graph of the function $h(x) = -\log_5(x + 6)$. (You might want to sketch the graph.)

a. Domain: $(-6, \infty)$

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

c. Asymptotes: $x = -6$



d. Interval of increasing or decreasing:

Decreasing on the interval $(-6, \infty)$

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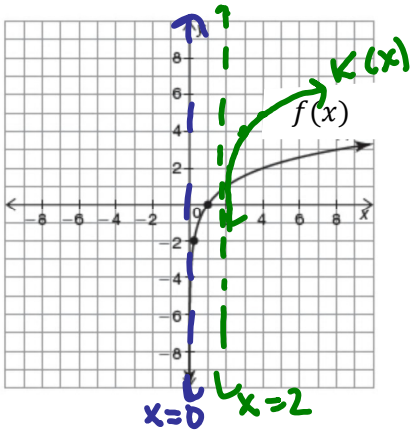
12. The graph of the logarithmic function $f(x)$ is shown. Graph the function $k(x) = f(x-2)+4$ on the same coordinate plane. Show the three corresponding reference points on your graph.



a. Describe the transformation on $f(x)$ to create $k(x)$.

Right 2, up 4

b. Draw and label each asymptote for f(x) and k(x) on the graph.

c. Write the logarithmic function. $k(x)=$ $\log_2(x-2)+4$

What

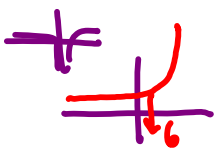
13. ~~Which~~ is the inverse of the logarithmic function $f(x) = \log_6 x$?

13. $f^{-1}(x) = 6^x$

14. Write a function that reflected over the x-axis and translated two unit left of the function $f(x) = \log x$?

14. $f(x) = -\log(x+2)$

15. Describe the intervals of increasing and decreasing for the function $(x) = \log_6(-x)$?



15. Decreasing on interval $(-\infty, 0)$

16. Name the intercept of $r(x) = 2^x - 6$?

16. $(0, -5)$

17. Identify the domain and range for the function $f(x) = \ln x$?

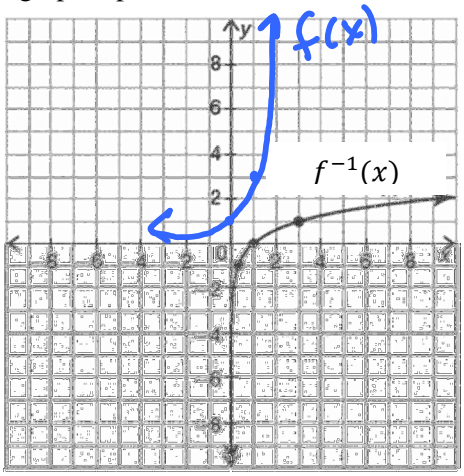
17. Domain: $(0, \infty)$

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

18. What is the asymptotic behavior of the function $f(x) = \ln(x+4)$?

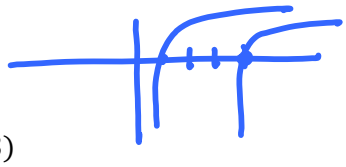
18. $\lim_{x \to -4^+} f(x) = -\infty$

19. The graph represents the inverse function. Graph $f(x)$ and write the equation for $f(x)$ and its inverse.



19. $f^{-1}(x) =$ $\log_3(x)$

$f(x) =$ 3^x



20. Name the intercept of the function $f(x) = \ln(x - 3)$ 20. (4,0)

21. Write the equation of the function that is a vertical stretched by a factor of 5, translated 3 units to the right and 6 units down from the function $f(x) = \log_7 x$?

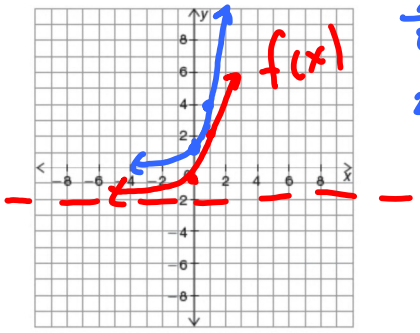
21. $f(x) = 5\log_7(x-3) - 6$

22. Describe the asymptote of the function $f(x) = \log_6 x$.

22. Vertical asymptote $x = 0$

23. Graph the following functions and identify the following characteristics. (Remember to start with the graph of the parent function first)

a) $f(x) = 4^x - 2$



4^x

x	y
0	1
1	4
2	16

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

Range: $(-2, \infty)$

Asymptote: $y = -2$

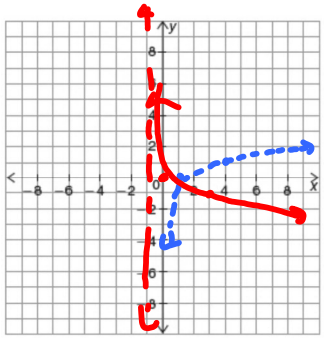
[redacted]

End Behavior: $\lim_{x \to -\infty} f(x) = -2$ $\lim_{x \to \infty} f(x) = \infty$

Intervals of increasing or decreasing:

Increasing $(-\infty, \infty)$

b) $g(x) = -\log_4(x + 1)$



Domain: $(-1, \infty)$

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

Asymptote: $x = -1$

Intercepts: $(0, 0)$

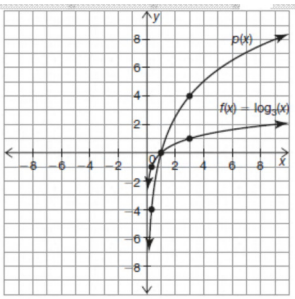
End Behavior: $\lim_{x \to \infty} g(x) = -\infty$

Asymptote Behavior: $\lim_{x \to -1^+} g(x) = \infty$

Intervals of increasing or decreasing:

Decreasing on interval $(-1, \infty)$

24. Write the equation for $p(x)$.



24. $p(x) =$ $4\log_3(x)$

25. Rewrite the following logarithmic equation as a corresponding exponential equation or exponential equation as a logarithmic equation.

a. $\log_3 81 = 4$ $3^4 = 81$

b. $3^{\frac{-1}{2}} = 9$ $\log_3 9 = -\frac{1}{2}$

c. $e^5 \approx 148.413$ $\ln_e 148.413 = 5$