Chapter 7 Review Worksheet

Name: KEY

Graph the function. Then state the domain and range.

1.) $f(x) = -3 \cdot 2^{x+1} - 2$

left 1 down 2

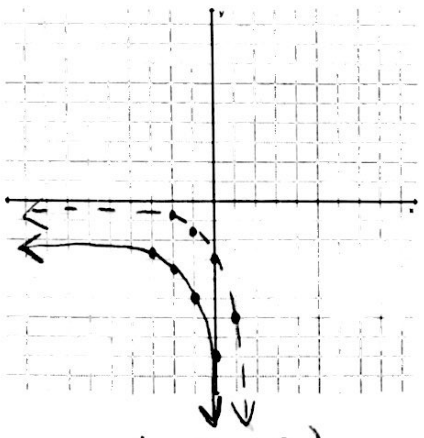
$y = -3 \cdot 2^x$

x	y
-2	-0.75
-1	-1.5
0	-3
1	-6
2	-12

OR

$y = -3 \cdot 2^{x+1} - 2$

x	y
-3	-2.75
-2	-3.5
-1	-5
0	-8



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

range: $(-\infty, -2)$

2.) $y = \frac{1}{2}e^{x-2}$

right 2

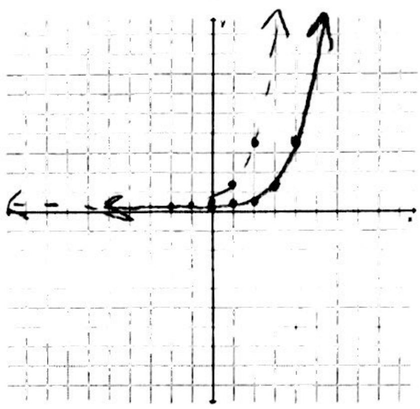
$y = \frac{1}{2}e^x$

x	y
-2	0.07
-1	0.18
0	0.5
1	1.36
2	3.69

OR

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

x	y
0	0.07
1	0.18
2	0.5
3	1.36
4	3.69



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

range: $(0, \infty)$

3.) $y = e^{-0.4(x+2)} + 6$

left 2 up 6

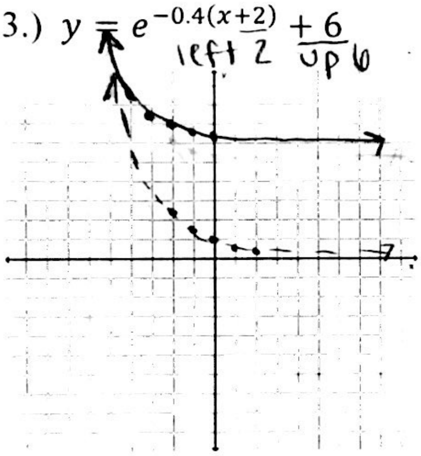
$y = e^{-0.4x}$

x	y
-2	2.23
-1	1.49
0	1
1	0.67
2	0.45

OR

$y = e^{-0.4(x+2)} + 6$

x	y
-4	8.23
-3	7.49
-2	7
-1	6.67



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

range: $(6, \infty)$

4.) $y = 2(0.8)^{x-1} + 3$

right 1 up 3

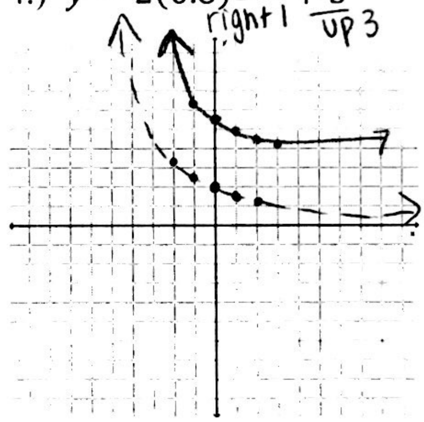
$y = 2(0.8)^x$

x	y
-2	3.13
-1	2.5
0	2
1	1.6
2	1.3

OR

$y = 2(0.8)^{x-1} + 3$

x	y
-2	6.91
-1	6.13
0	5.5
1	5



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

range: $(3, \infty)$

5.) You deposit \$1,500 into an account that pays 7% annual interest compounded daily. Find the balance of the account after 2 years.

$A = 1500\left(1 + \frac{0.07}{365}\right)^{365(2)}$

$A \approx \boxed{\$1725.39}$

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6.) You deposit \$750 in a bank account. Find the balance after 5 years for each of the situations described below.

a.) The account pays 2.5% annual interest compounded annually.

$A = 750\left(1 + \frac{0.025}{1}\right)^{1(5)}$

$A \approx \boxed{\$848.56}$

b.) The account pays 2.75% annual interest compounded monthly.

$A = 750\left(1 + \frac{0.0275}{12}\right)^{12(5)}$

$A \approx \boxed{\$860.42}$

c.) The account pays 3% annual interest compounded continuously.

$A = 750e^{0.03(5)}$

$A \approx \boxed{\$871.38}$

7.) From 1996 to 2001, the number of households that purchased lawn and garden products at home gardening centers increased by about 4.85% per year. In 1996, about 62 million households purchased lawn and garden products.

a.) Write a function giving the number of households H (in millions) that purchased lawn and garden products t years after 1996. (Remember to simplify)

$H = 62(1 + 0.0485)^t$

$\boxed{H = 62(1.0485)^t}$

b.) Approximately how many households purchased lawn and garden products were purchased in 2000? $t = 4$

$H = 62(1.0485)^4$

$H \approx \boxed{74.93 \text{ million}}$

8.) Your new boat is depreciating at an annual rate of 4%. You purchased the boat for \$1,906.

a.) Write a function that models the value y of the boat over time t.

$y = 1906(1 - 0.04)^t$

$\boxed{y = 1906(0.96)^t}$

c.) What was the approximate value of the boat in 5 years?

$y = 1906(0.96)^5$

$y \approx \boxed{\$1554.10}$

Rewrite the equation in its alternate form.

9.) $\log_2 128 = 7$

$\boxed{2^7 = 128}$

10.) $y = 5^{x+3}$

$\boxed{\log_5 y = x + 3}$

11.) $\ln 5x = 2.5$

$\boxed{e^{2.5} = 5x}$

12.) $10^{3x} = 50$

$\boxed{\log 50 = 3x}$

Evaluate the logarithm without using a calculator.

13.) $\log_3 243$

$3^? = 243$

$\boxed{5}$

14.) $\log_7 1$

$7^? = 1$

$\boxed{0}$

15.) $\log_{1/6} 216$

$1/6^? = 216$

$\boxed{-3}$

16.) $\log_{125} \frac{1}{5}$

$125^? = \frac{1}{5}$

$\boxed{-1/3}$

Find the inverse of the function.

17.) $y = \log_5 x$

$5^y = x$

$5^x = y$

$\boxed{y = 5^x}$

18.) $y = e^{x+2}$

$\ln y = x + 2$

$\ln x = y + 2$

$\boxed{y = \ln x - 2}$

19.) $f(x) = \log_6(x + 2)$

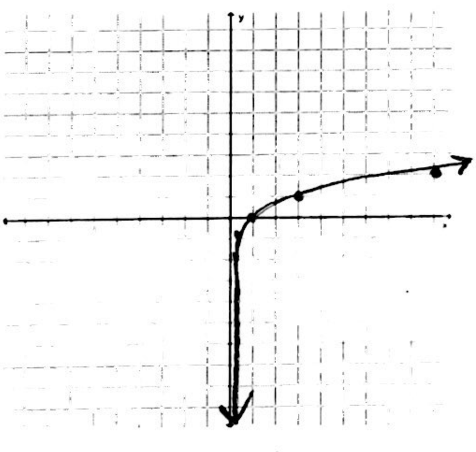
$6^y = x + 2$

$6^x = y + 2$

$\boxed{y = 6^x - 2}$

Graph the function. Then state the domain and range.

20.) $y = \log_3 x$ $\rightarrow$ $3^y = x$

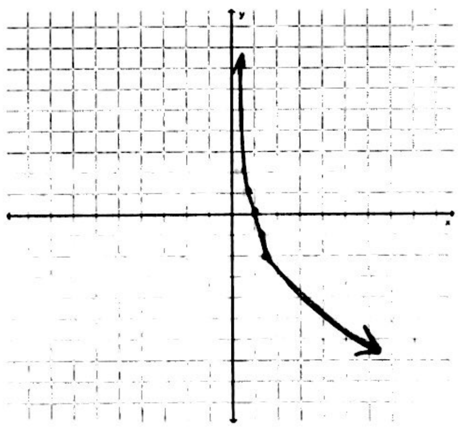


x	y
0.1	-2
0.3	-1
1	0
3	1
9	2

domain: $(0, \infty)$

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

21.) $f(x) = \log_{4/5} x$ $\rightarrow$ $4/5^y = x$



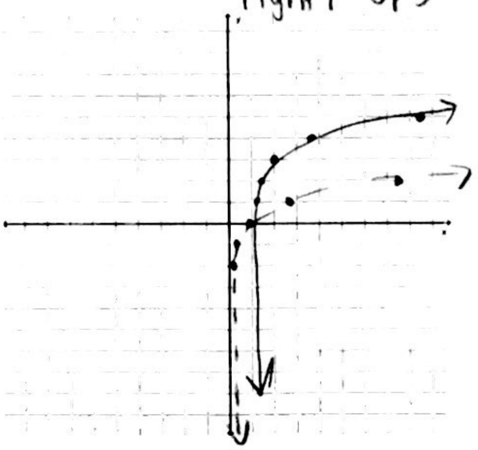
x	y
1.56	-2
1.25	-1
1	0
0.8	1
0.64	2

domain: $(0, \infty)$

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

22.) $g(x) = \ln(x-1) + 3$ $\rightarrow$ $e^y = x$

right 1 up 3



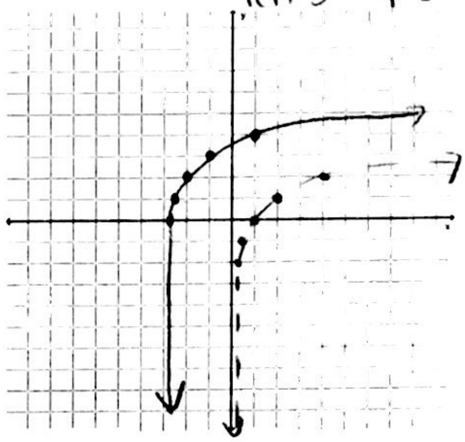
x	y
0.14	-2
0.37	-1
1	0
2.72	1
7.39	2

domain: $(1, \infty)$

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

23.) $y = \log_2(x+3) + 2$ $\rightarrow$ $2^y = x$

left 3 up 2



x	y
0.25	-2
0.5	-1
1	0
2	1
4	2

domain: $(-3, \infty)$

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

Use $\log 4 \approx 0.602$ and $\log 7 \approx 0.845$ to evaluate the logarithm.

24.) $\log \frac{7}{4}$

$\log 7 - \log 4$

$0.845 - 0.602$

$\approx \boxed{0.243}$

25.) $\log 28$ $\log(4 \cdot 7)$

$\log 4 + \log 7$

$0.602 + 0.845$

$\approx \boxed{1.447}$

26.) $\log 256$ $\log 4^4$

$4 \cdot \log 4$

$4(0.602)$

$\approx \boxed{2.408}$

27.) $\log 49$ $\log 7^2$

$2 \cdot \log 7$

$2(0.845)$

$\approx \boxed{1.69}$

28.) $\log 112$ $\log(4^2 \cdot 7)$

$\log 4^2 + \log 7$

$2(0.602) + 0.845$

$\approx 1.204 + 0.845$

$\approx \boxed{2.049}$

29.) $\log \frac{49}{64}$ $\log \frac{7^2}{4^3}$

$\log 7^2 - \log 4^3$

$2(0.845) - 3(0.602)$

$\approx 1.69 - 1.806$

$\approx \boxed{-0.116}$

Expand the expression.

30.) $\log_3 3x$

$\log_3 3 + \log_3 x$

$\boxed{1 + \log_3 x}$

31.) $\log \frac{2x}{5}$

$\log 2x - \log 5$

$\boxed{\log 2 + \log x - \log 5}$

32.) $\log_7 x^2 y$

$\log_7 x^2 + \log_7 y$

$\boxed{2\log_7 x + \log_7 y}$

33.) $\log \frac{100x^2}{y}$

$\log 100x^2 - \log y$

$\log 100 + \log x^2 - \log y$

$\boxed{2 + 2\log x - \log y}$

34.) $\ln 5xy^3$

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

$\boxed{\ln 5 + \ln x + 3\ln y}$

35.) $\log_9 \frac{2x^3}{3}$

$\log_9 2x^3 - \log_9 3$

$\log_9 2 + \log_9 x^3 - 1/2$

$\boxed{\log_9 2 + 3\log_9 x - 1/2}$

Condense the expression.

36.) $\log_3 4 + \log_3 2 + \log_3 2$

$\log_3(4\cdot 2\cdot 2)$

$\boxed{\log_3 16}$

37.) $\log 3 + \frac{1}{2}\log x - \log 5$

$\log 3 + \log x^{1/2} - \log 5$

$\log 3\sqrt{x} - \log 5$

$\boxed{\log \frac{3\sqrt{x}}{5}}$

38.) $4\ln x - 5\ln x$

$\ln x^4 - \ln x^5$

$\ln \frac{x^4}{x^5}$

$\boxed{\ln \frac{1}{x}}$

39.) $5\log_4 2 + 7\log_4 x + 4\log_4 y$

$\log_4 2^5 + \log_4 x^7 + \log_4 y^4$

$\log_4(32\cdot x^7\cdot y^4)$

$\boxed{\log_4 32x^7y^4}$

40.) $0.5\ln 100 - 2\ln x + 8\ln y$

$\ln 100^{1/2} - \ln x^2 + \ln y^8$

$\ln 10 + \ln y^8 - \ln x^2$

$\boxed{\ln \frac{10y^8}{x^2}}$

Use the change-of-base formula to evaluate the logarithm. Round to 4 decimal places when necessary.

41.) $\log_3 10$

$\frac{\log 10}{\log 3}$

$\approx \boxed{2.0959}$

42.) $\log_{2.2} 22$

$\frac{\log 22}{\log 2.2}$

$\approx \boxed{3.9204}$

43.) $\log_7 \frac{3}{16}$

$\frac{\log(3/16)}{\log 7}$

$\approx \boxed{-0.8603}$

Solve the equation. Check for extraneous solutions. Round your solution to three decimal places if necessary.

44.) $2^{x+1} = 16^{x+2}$

$2^{x+1} = (2^4)^{x+2}$

$2^{x+1} = 2^{4x+8}$

$x+1 = 4x+8$

$-3x = 7$

$\boxed{x = -7/3}$

45.) $e^{-x} = 4$

$\cancel{\ln e}^{-x} = \ln 4$

$-x = \ln 4$

$\boxed{x \approx -1.386}$

46.) $3^{2x} + 5 = 13$

$3^{2x} = 8$

$\cancel{\log_3 3}^{2x} = \log_3 8$

$2x = \frac{\log 8}{\log 3}$

$\boxed{x \approx 0.946}$

47.) $3^{x+1} - 5 = 10$

$3^{x+1} = 15$

$\cancel{\log_3} 3^{x+1} = \log_3 15$

$x + 1 = \dfrac{\log 15}{\log 3}$

$\boxed{x \approx 1.465}$

48.) $\cancel{\log_4}(4x + 7) = \cancel{\log_4} 11x$

$4x + 7 = 11x$

$7 = 7x$

$\boxed{x = 1}$

Check: ✓

49.) $\frac{3}{4}e^{3x} - 8 = -6$

$\frac{3}{4}e^{3x} = 2$

$e^{3x} = 8/3$

$\cancel{\ln e}^{3x} = \ln 8/3$

$3x = \ln 8/3$

$\boxed{x \approx 0.327}$

50.) $\log_2(3x - 1) = 8$

$\cancel{2^{\log_2}}{(3x-1)} = 2^8$

$3x - 1 = 256$

$3x = 257$

$\boxed{x = \frac{257}{3}}$

Check: ✓

51.) $3 \ln x - 7 = 4$

$3\ln x = 11$

$\ln x = 11/3$

$\cancel{e^{\ln}}{x} = e^{11/3}$

$\boxed{x \approx 39.121}$

Check: ✓

52.) $\ln 3x - \ln 2 = 4$

$\ln \frac{3x}{2} = 4$

$\cancel{e^{\ln}} \frac{3x}{2} = e^4$

$\frac{3x}{2} = e^4$

$3x = 2 \cdot e^4$

$\boxed{x \approx 36.399}$

Check: ✓

53.) $\log_6(x + 9) + \log_6 x = 2$

$\log_6 (x(x+9)) = 2$

$\log_6 (x^2+9x) = 2$

$\cancel{6^{\log_6}} (x^2+9x) = 6^2$

$x^2 + 9x = 36$

$x^2 + 9x - 36 = 0$

$(x+12)(x-3) = 0$

extraneous

$\boxed{\cancel{x = -12}}$

$\boxed{x = 3}$

54.) The average weight y (in kilograms) of an Atlantic cod from the Gulf of Maine can be modeled by $y = 0.51(1.46)^x$ where x is the age of the cod (in years). Estimate the age of a cod that weighs 15 kilograms.

$15 = 0.51(1.46)^x$

$29.41 = 1.46^x$

$\log_{1.46} 29.41 = \cancel{\log_{1.46} 1.46}^x$

$x = \dfrac{\log 29.41}{\log 1.46}$

$x \approx \boxed{8.9 \text{ years}}$

55.) You deposit \$100 into an account that pays 6% annual interest compounded daily. How long will it take for the balance to reach \$1,000.

$1{,}000 = 100(1 + \frac{0.06}{365})^{365t}$

$1{,}000 = 100(1.0001\ldots)^{365t}$

$10 = (1.0001\ldots)^{365t}$

$\log_{1.0001\ldots} 10 = \cancel{\log_{1.0001\ldots} (1.0001)}^{365t}$

$\dfrac{\log 10}{\log(1.0001\ldots)} = 365t$

$t \approx \boxed{38.4 \text{ years}}$