

F. S. T.  
Ch. 6 Review

Name KEY  
Block \_\_\_\_\_ Date \_\_\_\_\_

Non-Calculator

Simplify and/or evaluate:

1.  $y^5 \cdot y^7 = y^{12}$

2.  $\frac{x^2}{x^8} = x^{-6} = \frac{1}{x^6}$

3.  $49^0 = 1$

4.  $\sqrt[3]{-729} = -9$

5.  $\sqrt{-625}$  not possible

6.  $27^{\frac{5}{3}} = (27^{\frac{1}{3}})^5 = (3)^5 = 243$

7.  $(x^2)^5 = x^{10}$

8.  $64^{\frac{-2}{3}} = (64^{\frac{1}{3}})^{-2} = (4)^{-2} = \frac{1}{16}$

9.  $\log_5 625 = x$   
 $5^x = 625$   
 $x = 4$

10.  $\log_{\frac{1}{256}} 4 = x$   
 $(\frac{1}{256})^x = 4$   
 $(\frac{1}{4^4})^x = 4^1$   
 $4^{-4x} = 4^1$   
 $-4x = 1$   
 $x = -\frac{1}{4}$

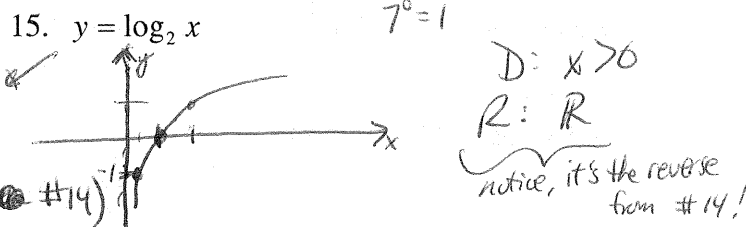
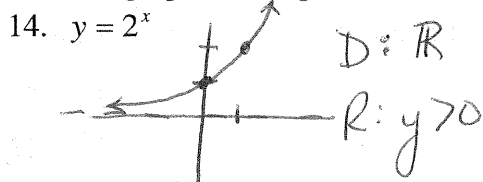
Expand or condense each logarithm:

11.  $\log_2 \frac{x^3}{5}$   
 $\log_2 x^3 - \log_2 5$   
 $3 \log_2 x - \log_2 5$

12.  $\log 4 + 2 \log x - \log 5$   
 $\log 4 + \log x^2 - \log 5$   
 $\log (4x^2) - \log 5 = \log \left(\frac{4x^2}{5}\right)$

13.  $\log_7 \frac{1}{x^2} = \log_7 1 - \log_7 x^2$   
 $0 - 2 \log_7 x$   
since  $7^0 = 1$

Sketch a graph. Then give the domain and range.



Use  $\log 2 \approx 0.301$  and  $\log 3 \approx 0.477$  to evaluate:

16.  $\log 6$   
 $\log(2 \cdot 3) = \log(2) + \log(3)$   
 $= .301 + .477$   
 $= .778$

solve for these  $\begin{matrix} x & y \\ \frac{1}{2} & -1 \\ 1 & 0 \\ 2 & 1 \end{matrix}$  make up these

17.  $\log \frac{3}{4} = \log \frac{3}{2^2} = \log 3 - \log 2^2$   
 $= \log 3 - 2 \log 2$   
 $= .477 - 2(.301)$   
 $= .477 - .602 = -.125$

Solve:  
18.  $\frac{1}{3} \ln 27 = \ln x$   
 $\ln(27^{\frac{1}{3}}) = \ln(x)$   
 $\ln(3) = \ln(x)$   
 $3 = x$

19.  $\log_7 x - \log_7 12 = \log_7 2$   
 $\log_7 \left(\frac{x}{12}\right) = \log_7(2)$   
 $\frac{x}{12} = 2$   
 $x = 24$

**Calculator Allowed**

20. Write  $r$  as a function of  $V$ :  $V = \frac{4}{3}\pi r^2 h$

$$\left(\frac{3}{4}\right)V = \frac{4}{3}\pi r^2 h \cdot \left(\frac{3}{4}\right)$$

$$\left(\frac{1}{\pi}\right)\frac{3V}{4} = \pi r^2 h \cdot \left(\frac{1}{\pi}\right) \rightarrow \left(\frac{1}{h}\right)\frac{3V}{4\pi} = r^2 h \cdot \left(\frac{1}{h}\right)$$

$$\frac{3V}{4\pi} = r^2 h \quad \frac{3V}{4\pi h} = r^2$$

$$r = \sqrt{\frac{3V}{4\pi h}}$$

21. Sue deposits \$1300 at an annual interest rate of 6.25%.

a. How much does she have in the account after 5 years of interest compounded monthly?

$$\text{Balance} = 1300 \left(1 + \frac{.0625}{12}\right)^{60} \approx \$1775.45$$

b. How much does she have in 5 years compounded continuously?

$$\text{Balance} = 1300 e^{(.0625)(5)} \approx \$1776.89$$

Notice, they are close, but compounding continuously gives you a little more!

22. Jonah invests \$577.53 at 7.5% interest compounded quarterly. What is the effective annual yield?

$$\left(1 + \frac{.075}{4}\right)^4 \approx 1.0771$$

which is a growth rate of  $\boxed{7.71\%}$   
 Instead of getting 7.5% compounded quarterly.

Solve:

23.  $4e^x - 6 = 87$

$$4e^x = 93$$

$$e^x = \frac{93}{4}$$

$$\ln\left(\frac{93}{4}\right) = \boxed{x \approx 3.146}$$

24.  $9^{x+3} + 5 = 70$

$$9^{x+3} = 65$$

$$\log_9 65 = x + 3$$

$$\frac{\log 65}{\log 9} - 3 = \boxed{x \approx -1.1}$$

25.  $5 \log_7(2x-3) = 14$

$$\log_7(2x-3) = \frac{14}{5}$$

$$7^{14/5} = 2x - 3$$

$$7^{14/5} + 3 = 2x \rightarrow \frac{7^{14/5} + 3}{2} = x$$

You could get 7.71% once a year.

$$\boxed{117.710}$$

26. The equation  $T(d) = T_0 \left(\frac{1}{2}\right)^{\frac{d}{10}}$  gives the toxicity of sewage after  $d$  days of treatment.  $T_0$  is the initial value of toxicity.

a. Evaluate  $T(4)$  if  $T_0 = 12$ .

$$T(4) = 12 \left(\frac{1}{2}\right)^{4/10} \approx \boxed{9.094}$$

b. What value of  $d$  would give a toxicity of 5 if  $T_0 = 14$ ?

$$5 = 14 \left(\frac{1}{2}\right)^{d/10} \rightarrow \frac{5}{14} = \left(\frac{1}{2}\right)^{d/10}$$

$$\log_{1/2} \left(\frac{5}{14}\right) = \frac{d}{10}$$

$$\frac{\log \left(\frac{5}{14}\right)}{\log \left(\frac{1}{2}\right)} = \frac{d}{10}$$

$$\frac{10 \log \left(\frac{5}{14}\right)}{\log \left(\frac{1}{2}\right)} = d$$

$$\boxed{14.854 \approx d}$$

27. Rewrite  $y$  as a function of  $x$ :

$$\ln y = 2.75x + 1.08$$

$$e^{2.75x + 1.08} = y$$

$$e^{2.75x} e^{1.08} = y$$

$$\boxed{(15.642)^x \cdot (2.945) = y}$$

28. Rewrite as a linear function:

$$y = 2.8(1.3)^x$$

$$\log(y) = \log(2.8(1.3)^x)$$

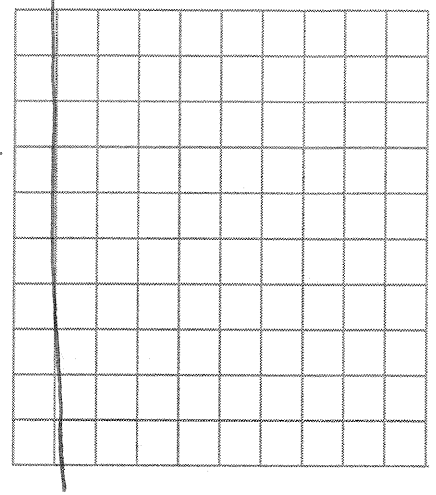
$$\log(y) = \log 2.8 + \log(1.3)^x$$

$$\log(y) = \log 2.8 + x \log(1.3)$$

$$\log(y) = .447 + .114x$$

29. The Femur is a large bone located in the leg or hind limb of a human or animal. The table shows the average circumference  $C$  of the femur for several species of animals. It also shows each animal's average weight  $W$ .

Animal	$C$ (mm)	$W$ (kg)	$L_3$ $\log C$	$L_4$ $\log W$
Meadow Mouse	5.5	0.047	.7436	-1.328
Gray Squirrel	13	0.399	1.1139	-.399
Porcupine	34	7.20	1.5315	.85733
Yellow Baboon	57	28.6	1.7559	1.4564
Lion	93.5	143	1.9708	2.1553
Polar Bear	135	448	2.1303	2.6513
Giraffe	173	710	2.238	2.8513



a. Make a scatter plot of the data pairs ( $\log C$ ,  $\log W$ ).

*see next page*

*we calc...* b. Find a Linear Regression equation for your data pairs from (a).

$$\log W = 2.86 \log C - 3.51$$

c. Rewrite your equation giving  $C$  as a function of  $W$ . (the answer key gives  $W$  as a function of  $C$ )

$$\log W = \log C^{2.86} - 3.51$$

$$10^{(\log C^{2.86} - 3.51)} = W \rightarrow 10^{\log C^{2.86}} 10^{-3.51} = W$$

*Let's do that!!!*

Note:  $3.090295433 \times 10^{-4}$   
means  $3.090295433 \times 10^{-4}$   
 $\approx .00031$

$$C^{2.86} (.00031) = W$$

## Chapter 2 and 3 Review

### Non-Calculator

30. Let  $S = \{(3,5), (-2,6), (3,-1), (4,-2)\}$

a. State the domain and range of  $S$ .

Domain =  $\{3, -2, 4\}$  (x's)      Range =  $\{5, 6, -1, -2\}$  (y's)

*Yes, any set of ordered pairs is a relation*

b. Is  $S$  a relation? A function? Or both?

*No*  
 $x=3$  has 2 outputs

*S is only a relation*

31. Let  $f$  be the function  $f(x) = (x-7)^3 - 2$ .

a. Identify the parent function,  $p(x)$ .

$$p(x) = x^3$$

b. State the translation rule that maps  $p$  to  $f$ .

$$(x,y) \rightarrow (x+7, y-2)$$

*"Right 7, Down 2"*

32. Consider the function  $g(x) = |x|$ .

a. Find an equation for the image of the graph under the transformation  $S : (x, y) \rightarrow \left(\frac{1}{4}x, 2y\right)$ .

$$S(x) = 2|4x|$$

b. Describe in words the effect  $S$  has on the graph of  $g$ .

*Horizontal Shrink by a factor of 1/4*  
*Vertical Stretch by a factor of 2*

*inside "opposite", x's*  
*outside, "same", y's*

### Calculator Allowed

33. Evaluate  $\left[2.3 - \left[\frac{1}{2}(3.7) + 4.8\right]\right]$ .

$$\left[2.3 - \left[1.85 + 4.8\right]\right]$$

$$\left[2.3 - 6.65\right]$$

$$\left[-3.77\right]$$

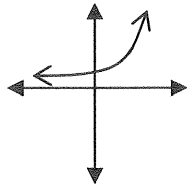
$$\boxed{-3}$$

F.S.T. Chapter 6 Review Key

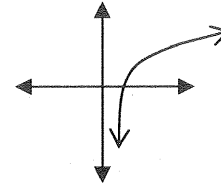
1.  $y^{12}$                       2.  $\frac{1}{x^6}$                       3. 1                      4. -9                      5. No Solution  
 6. 243                      7.  $x^{10}$                       8.  $\frac{1}{16}$                       9. 4                      10.  $-\frac{1}{4}$

11.  $3\log_2 x - \log_2 5$                       12.  $\log \frac{4x^2}{5}$                       13.  $-2\log_7 x$

14. D:  $x \in \mathbb{R}$   
R:  $y > 0$



15. D:  $x > 0$   
R:  $y \in \mathbb{R}$



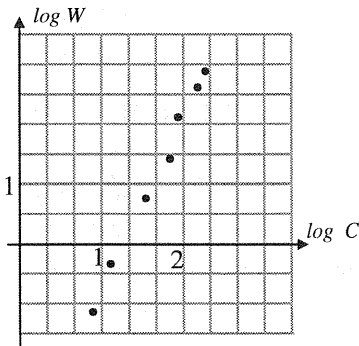
16. 0.778                      17. -0.125                      18.  $x = 3$                       19.  $x = 24$

20.  $r = \sqrt{\frac{3V}{4\pi h}}$                       21. a) \$1775.45                      b) \$1776.89                      22. 7.71%

23.  $x = 3.15$                       24.  $x = -1.1$                       25.  $x = 117.7$

26. a) 9.09    b) 14.9 days                      27.  $y = 2.94(15.64)^x$                       28.  $\log y = 0.114x + 0.447$

29. a)                      b)  $y = 2.86x - 3.51$



- c)  $W = .00031C^{2.86}$

"W as a function of C"

C as a function of W would be

$$\left(\frac{W}{.00031}\right)^{\frac{1}{2.86}} = C$$

30. a)  $D: \{-2, 3, 4\}; R: \{-2, -1, 5, 6\}$                       b) S is a relation; S is not a function.

31. a)  $p(x) = x^3$                       b)  $(x, y) \rightarrow (x+7, y-2)$

32. a)  $y = 2|4x|$                       b) S gives a horizontal shrink of  $\frac{1}{4}$  and a vertical stretch of 2.

33. -3