

Name: _____

Date: _____

Advanced Functions - Review for Functions/Regression Test WS

Answer each question or complete each problem. Show your work!!

1. What is the domain and range of the following function: $y = |x - 3| - 2$?

$$D: (-\infty, \infty) \quad R: [-2, \infty)$$

2. What is the domain and range of the following function: $y = \sqrt{x + 4} + 1$?

$$D: [-4, \infty) \quad R: [1, \infty)$$

3. Write the following inequality in interval notation: $\mathbb{R}, x \neq -2, 3$

$$(-\infty, -2) \cup (-2, 3) \cup (3, \infty)$$

4. What is the asymptote, domain, and range of $y = 3^{x+2} - 5$?

$$HA: y = -5 \quad D: (-\infty, \infty) \quad R: (-5, \infty)$$

5. What is the asymptote, domain, and range of $y = \ln(x - 3) + 4$?

$$VA: x = 3 \quad D: (3, \infty) \quad R: (-\infty, \infty)$$

6. a.) Write the following in logarithmic form: $3^2 = 9$.

$$\log_3 9 = 2$$

- b.) Write the following in exponential form: $\log_8 \left(\frac{1}{512} \right) = -3$

$$8^{-3} = \frac{1}{512}$$

7. Evaluate each expression:

a.) $\log_5 625 = x$

b.) $\log_4 \left(\frac{1}{32} \right) = x$

c.) $\log_x 4 = \frac{1}{3}$

a.) $5^x = 625$
 $x = 4$

b.) $4^x = \frac{1}{32}$
 $2^{2x} = 2^{-5}$
 $x = -\frac{5}{2}$

d.) $e^{\ln 14 - \ln 2}$
 $e^{\ln \frac{14}{2}} = 7$

e.) $\log_3 27 + \log_3 9$
 $\log_3 (27 \cdot 9) = \log_3 243 = x$

f.) $\log \sqrt{1000}$
 $\log (10^3)^{\frac{1}{2}} = \log 10^{\frac{3}{2}} = \frac{3}{2}$
 $x = \frac{3}{2}$

c.) $x^{\frac{1}{3}} = 4$
 $\sqrt[3]{x} = 4$
 $x = 64$

e.) $3^x = 243$
 $3^x = 3^5$
 $x = 5$

8. Solve the following exponential equations (round to 3 places).

a.) $8^{2x+4} = 32$ $x = -1.1667$

c.) $4^{3x+5} = 3$ $x = -1.403$

b.) $6^{6-4x} = \frac{1}{36}$ $x = 2$

d.) $6e^{4x-1} - 4 = 8$ $x = .423$

9. Solve the following logarithmic equations (round to 3 places):

a.) $\log_5 (2x + 4) - \log_5 3 = \log_5 10$ $x = 13$

c.) $2 \log_7 (-9x - 8) - 1 = 5$ $x = -39$

b.) $\log_2 9 + 2 \log_2 x = \log_2 144$

d.) $3 - 4 \ln(x + 6) = 7$ $x = -5.632$

$x = 4$ ($x = -4$ excluded)

10. You bought an antique that appreciates by 6% each year you own it. The original value of the antique was \$200. How much will the antique be worth after you've owned it for 8 years? \$318.77

11. George is investing \$1500 into an account with a 7% interest rate.

a.) How long will it take for the account to be \$2,126 if the money is compounded monthly? 5 years

b.) How long will it take for the account to triple if the money is compounded continuously? 15.7 years

12. Use the pH formula to find the following:

a.) What is the pH of a liquid with a hydrogen ion concentration of $6.5 \times 10^{-8} M$?

$pH = 7.2$

b.) What is the hydrogen ion concentration of a juice drink if its pH is 2.6?

$H = 2.5 \times 10^{-3} M$

$$y = k \cdot x^p$$

13. Determine if the following are power functions? If so, what are the values of k and p :

a.) $f(x) = \sqrt{\frac{36}{x^{16}}} = 6x^{-8}$

b.) $f(x) = 9 \cdot 5^x$

Yes $\rightarrow k=6$
 $p=-8$

No

14. Write a power function in the form $y = k \cdot x^p$ that contains the points (13, 12) and (1, 10).

$y = 10 \cdot x^{-0.711}$

L1	L2
13	12
1	10

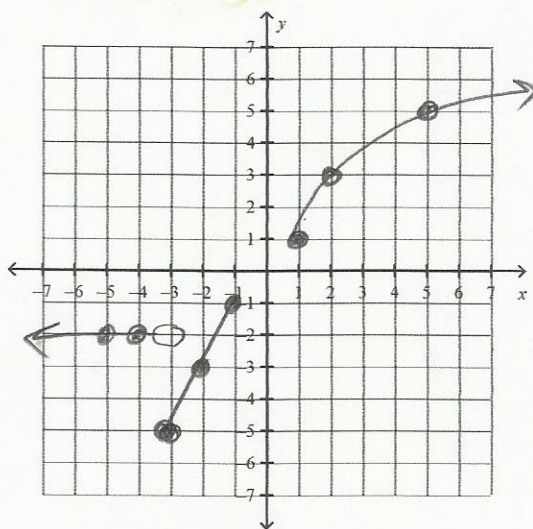
Power reg eq.

15. The temperature T of a given mass of gas varies inversely with its volume V . The temperature of 105 cubic centimeters of a certain gas is 30°C . What will the volume of the gas if the temperature is 37.5°C ?

$T = \frac{k}{V} \rightarrow k = 3150 \rightarrow V = 84 \text{ cm}^3$

16. Graph and state domain/range for the following piecewise function:

$$f(x) = \begin{cases} -2 & \text{if } x < -3 \\ 2x+1 & \text{if } -3 \leq x \leq -1 \\ 2\sqrt{x-1}+1 & \text{if } x \geq 1 \end{cases}$$



-2	$2x+1$	$2\sqrt{x-1}+1$
$(-3, -2)$	$(-3, -5)$	$(1, 1)$
$(-4, -2)$	$(-2, -3)$	$(2, 3)$
$(-5, -2)$	$(-1, -1)$	$(5, 5)$

$D: (-\infty, -1] \cup [1, \infty)$
 $R: [-5, -1] \cup [1, \infty)$

The number of females practicing medicine as MDs is given in the table for selected years. An EXPONENTIAL model best fits this data set.

Year (1980 = 0)	0	5	10	13	14	15	16
Female MDs (1000s)	48.7	74.8	96.1	117.2	124.9	140.1	148.3

17. Based on the appropriate model, how many female physicians were practicing in 2000?

$x=20$ $y=?$ table

191,467 female MDs

18. Based on the appropriate model, when will the number of practicing female physicians reach 300,000?

$x=?$ $y=300$
Intersect

$x \approx 27 \Rightarrow 2007$

Biologists have found that the number of chirps some crickets make per minute is a linear relationship. When the temperature is 68°F , the crickets chirp 124 times a minute. When it's 80°F outside, the crickets chirp 172 times a minute.

19. How warm is it when the crickets are chirping 150 times a minute?

$x=?$ $y=150$

74.5°F

L1	L2
68	124
80	172

20. If the temperature is 96°F , how many times per minutes will the crickets chirp?

$x=96$ $y=?$

236 chirps/min

Adv functions - Rev for Functions/Regression Test + WS

8a) $8^{2x+4} = 32$

$$(2^3)^{2x+4} = 2^5$$

$$3(2x+4) = 5$$

$$6x + 12 = 5$$
$$\underline{-12} \quad \underline{-12}$$

$$\frac{6x}{6} = \frac{-7}{6}$$

$$\boxed{X = -1.1667}$$

8b) $6^{6-4x} = \frac{1}{36}$

$$6^{6-4x} = 6^{-2}$$

$$\frac{6-4x}{-6} = \frac{-2}{-6}$$

$$\frac{-4x}{-4} = \frac{-8}{-4}$$

$$\boxed{X = 2}$$

8c) $4^{3x+5} = 3$

$$\log 4^{3x+5} = \log 3$$

$$\frac{(3x+5)\log 4}{\log 4} = \frac{\log 3}{\log 4}$$

$$3x + 5 = .792481$$

$$\frac{3x}{3} = \frac{-4.207519}{3}$$

$$\boxed{X = -1.403}$$

8d) $6e^{4x-1} - 4 = 8$

$$\frac{6e^{4x-1}}{6} = \frac{12}{6}$$

$$e^{4x-1} = 2$$

$$\ln e^{4x-1} = \ln 2$$

$$\frac{4x-1}{+1} = \frac{\ln(2)}{+1}$$

$$\frac{4x}{4} = \frac{\ln(2)+1}{4}$$

$$\boxed{X = .423}$$

9a) $\log_5(2x+4) - \log_5 3 = \log_5 10$

$$\log_5 \frac{2x+4}{3} = \log_5 10$$

$$\frac{2x+4}{3} = 10$$

$$2x+4 = 30$$

$$\frac{2x}{2} = \frac{26}{2}$$

$$\boxed{X = 13}$$

9b) $\log_2 9 + 2\log_2 X = \log_2 144$

$$\log_2 9x^2 = \log_2 144$$

$$9x^2 = 12^2$$

$$9x^2 = 144$$

$$x^2 = 16$$

$$x = \pm 4$$

$$\boxed{X = 4} \quad \downarrow \quad X = -4 \text{ (ex sol)}$$

9c) $2\log_7(-9x-8) - 1 = 5$

$$\frac{2\log_7(-9x-8)}{2} = \frac{6}{2}$$

$$\log_7(-9x-8) = 3$$

$$7^3 = -9x-8$$

$$343 = -9x-8$$

$$351 = -9x$$

$$\boxed{X = -39}$$

9d) $3 - 4\ln(x+6) = 7$

$$\frac{-4\ln(x+6)}{-3} = \frac{4}{-3}$$

$$\ln(x+6) = -1$$

$$e^{x+6} = e^{-1}$$

$$\frac{x+6}{-6} = \frac{-1}{-6}$$

$$\boxed{X = -5.632}$$

$$10) A = P(1+r)^t$$

$$A = 200(1+.06)^t$$

$$A = 200(1+.06)^8$$

$$A = \boxed{\$318.77}$$

$$11) a) 2126 = 1500(1 + \frac{.07}{12})^{12t}$$

$$1.417333 = (1.005833)^{12t}$$

$$\log 1.417333 = 12t \log(1.005833)$$

$$\uparrow (12 \log(1.005833))$$

$$\boxed{t = 5 \text{ years}}$$

$$12) a) pH = -\log(6.5 \times 10^{-8})$$

$$\boxed{pH = 7.2}$$

$$b) 2.6 = -\log H$$

$$-2.6 = \log_{10} H = -2.6$$

$$H = 10^{-2.6}$$

$$\boxed{H = 2.5 \times 10^{-3} M}$$

$$b) \frac{4500}{1500} = \frac{1500}{1500} e^{.07t}$$

$$3 = e^{.07t}$$

$$\frac{\ln 3}{.07} = \frac{.07t}{.07}$$

$$\boxed{t = 15.7 \text{ years}}$$

$$14) (13, 12) (1, 10) \rightarrow K=10$$

power funct = ?

$$\textcircled{1} y = 10 \cdot x^p$$

$$\frac{12}{10} = \frac{10 \cdot (13)^p}{10}$$

$$1.2 = (13)^p$$

$$\frac{\log 1.2}{\log 13} = \frac{p \log 13}{\log 13}$$

$$p = .0711$$

$$\boxed{y = 10x^{.0711}}$$

$$15) T = \frac{K}{V} \rightarrow T = \frac{3150}{V}$$

$$30 = \frac{K}{105}$$

$$K = 3150$$

$$37.5 = \frac{3150}{V}$$

$$\frac{37.5V}{37.5} = \frac{3150}{37.5}$$

$$\boxed{V = 84 \text{ cm}^3}$$

$$\textcircled{2} \begin{array}{c|c} L1 & L2 \\ \hline 13 & 12 \\ 1 & 10 \end{array}$$

\Rightarrow do power regression...