NAME:____ DATE:_______________________

EXPONENTS AND LOGS: Corrective Assignment

PROPERTIES

Evaluate (+2 pts each)

1. $\log_{\left(\frac{1}{2}\right)}\left(\frac{1}{8}\right)$

2. $\log_2 \frac{1}{256}$

3. $\log_\pi 1$

Express in the exponential form (+2 pts each)

4. $\log_{13} 2197 = 3$

5. $\log 10{,}000 = 4$

6. $ln\, e = 1$

Condense (Write as a single logarithm). (+2 pts each)

7. $\log_5 a + \frac{1}{3}\log_5 b$

8. $\frac{1}{2} ln\, x - 8\, ln\, 7$

Expand. (Write as sum or diff of logs). (+2 pts each)

9. $\log_6 \quad 6y\sqrt{wz}$

10. $\log_9(3^4 \cdot 2^6)^2$

Evaluate to 3 decimal places. (+2 pts each)

11. $\log_5 22$_______________

12. ln 51 ________________

13. $\log_7 51$_______________

Solve for the indicated variable. Round to three digits where applicable. (+4 pts each)

14. $\left(2^{(x+2)}\right)^{(x-2)} = 4096$

15. $3^{3k+3} \cdot \frac{1}{27} = 81$

16. $6^x + 6 = 66$

x = _____________

k = _____________

x = _____________

For questions 16 – 19, solve for the indicated variable. Round to three digits where applicable. (+4 pts each)

17. $\log(x-5)+\log x=1$ $\qquad$ x = ____________

18. $2\log_5 k-3=5$ $\qquad$ k = ____________

19. $2\log_5(x+3)=5$ $\qquad$ x = ____________

20. $7e^{d-2}=21$ $\qquad$ d = ____________

Find the inverse of the given function. (+4 pts each)

21. $f(x)=7^{x+2}$

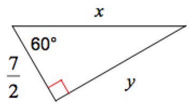
$f^{-1}(x)$ = ____________

22. ln y = ln (2x - 1)

$f^{-1}(x)$ = ____________

Solve for the missing variables: (+1 pt each)

23.



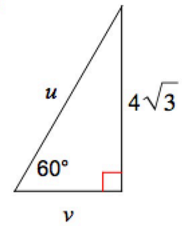
$x =$ ____________

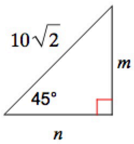
$y =$ ____________

24.

$u =$ ____________

$v =$ ____________



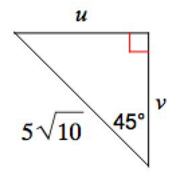


$m =$ ____________

$n =$ ____________

$u =$ ____________

$v =$ ____________



25. The half-life of a certain radioactive substance is 8.5 seconds. If the initial value is 3200 grams, find how long it will take for there to be 200 grams of the radio active substance. (+4 points)

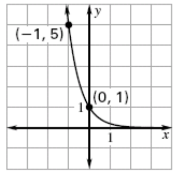
26. Find how long you need to invest \$200 at 3.5% interest compounded quarterly for your investment to equal \$2500. (+4 points)

27. Bean has a BBQ for his basketball team and starts his grill, which promptly heats up to about 350 °F. He then gets distracted by the hamburger dance and his gas grill runs out of propane. When Bean checks his grill 5 minutes after the propane ran out, the grill has cooled to 275 °F. Assume the outside temperature was 45 °F.

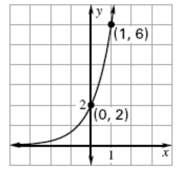
a. Use Newton's Law of Cooling to find k. (+4 points)

b. How long will it take the grill to cool down to a safe temperature (90°F)? (+4 pts)

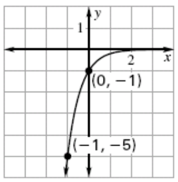
28. Use the given parent functions to write the equations of the functions below.

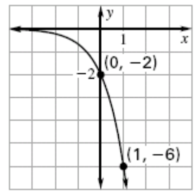


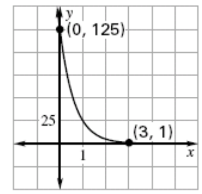
$$f(x)=\left(\frac{1}{5}\right)^x$$



$$f(x)=2\cdot 3^x$$





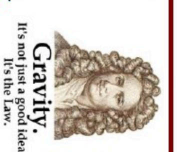


F(x) = ________________ *F(x)* = ________________ *F(x)* = ________________

29. Sully invests \$1 at 9% interest, compounded continuously. In how many years will that \$1 investment be worth \$100? (+4 pts)

Useful stuff to know:

Newton's Law of Cooling: $T(t) = T_s + (T_0 - T_s)e^{-kt}$



$T(t)$ is the temperature of the object after time t.
T_s is the temperature of the surrounding environment.
T_0 is the initial temperature of the object (at time $t = 0$).
k is a constant that changes depending on the material properties of the object.
t is the amount of time (in minutes) that has passed since the object began cooling.

Decibel Levels: $D(I) = 10\log\left(\frac{I}{I_o}\right)$

$D(I)$ is the decibel level (loudness) as a function of I.
I is the intensity of the sound (watts per square meter).
$I_o = 10^{-12}$ and represents the intensity of the quietest sound a human can hear.

Earthquake Intensity (Richter Scale): $M = \frac{2}{3}log\frac{E}{E_o}$

M is the magnitude of the earthquake
E = the energy released by the earthquake (joules)
$E_o = 10^{4.40}$ joules, the energy released by a small reference earthquake

Rocket Science $v = c\ ln\frac{W_t}{W_b}$

v is the velocity of a rocket at fuel burnout (when it runs out of fuel)
W_t = the takeoff weight (fuel, structure and payload)
W_b = burnout weight (only structure and payload) c = exhaust velocity of the rocket

Half-Life Decay $A = A_o\left(\frac{1}{2}\right)^{t/h}$ or $A_o(2)^{-t/h}$

A is the amount at time t
A_o = the amount at time = 0
h = half-life

Carbon-14 Dating $A = A_o e^{-0.000124t}$

A is the amount after t years
A_o = the amount at time = 0
t = time

The amount of carbon-14 remains constant as long as a plant or animal is alive. Once dead, the organism ceases to take in carbon-14, and the remaining carbon-14 starts to decay. This can be used to date artifacts that are super old, like Bean's jokes.

COMPOUND INTEREST

$$A = P\left(1+\frac{r}{n}\right)^{nt}$$

t = time (years) P = principal (initial investment)
r = annual interest rate
n = the number of times the interest is compounded (paid) per year.

GROWTH AND DECAY MODELS

$$y = a(1 \pm r)^t$$

t = time a = initial value
r = rate of change
+ = increase - = decrease

CONTINUOUSLY COMPOUNDED INTEREST $A = Pe^{rt}$

t = time (years) P = principal (initial investment)
r = annual interest rate
A = amount in the account