Name: _____

Honors Precalc Unit 3 Quiz 2 Review

U4LT4 - I can apply properties of exponents and logarithms to solve equations. Round to the hundredths.

1. $7^{2x+1} = 12$

Method One

$\log_7 12 = 2x-1$

$1.27699 = 2x-1$

$x = 1.138$

Method 2

$\ln 7^{2x+1} = \ln 12$

$2x+1(\ln 7) = \ln 12$

$2x+1 = \frac{\ln 12}{\ln 7}$

$x = 1.138$

2. $100e^{-0.6x} = 20$

$e^{-0.6x} = .2$

$\ln e^{-0.6x} = \ln .2$

$-0.6x = \ln .2$

$x = -1.155$

↑ whoops → I rounded to the thousandth

3. $2\log x - 3\log 2 = 2$

$\log x^2 - \log 2^3 = 2$

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

$10^2 = \frac{x^2}{8}$

$800 = x^2$

$x = 28.28$

4. $\frac{1}{3}\log_2 x + 5 = 7$

$\frac{1}{3}\log_2 x = 2$

$\log_2 x = 6$

$2^6 = x$

$x = 64$

← or you can make it an exponent

5. $\log(x+3) = \log x + \log(x-1)$

$\log(x+3) = \log(x^2 - x)$

$x+3 = x^2 - x$

$0 = x^2 - 2x - 3$

$0 = (x-3)(x+1)$

$x = 3$ $x \neq -1$ can't work because

6. $2e^{2x} - 5e^x - 3 = 0$ Tricky!

$(2e^x + 1)(e^x - 3) = 0$

$2e^x + 1 = 0$ or $e^x - 3 = 0$

$2e^x = -1$ $e^x = 3$

$e^x = -1/2$ $\ln 3 = x$

$\ln -\frac{1}{2} = x$ $x = 1.099$

Not possible

U4LT5 - I can apply my knowledge of exponential and logarithmic functions to investigate real world applications. Round to the hundredths.

You will need to know two of these equations on the quiz!

$A = P(1+r)^t$	$A = P\left(1+\frac{r}{n}\right)^{nt}$	$u(t) = T + (I_0 - T)e^{-kt}$	$A = P(0.5)^t$
Population	**Compound Interest**	**Newton's Law of Cooling**	**Half-life**

5. A cup of coffee is 81 degrees F after it is brewed. Two minutes later, the coffee is 79 degrees. The temperature of the cold fall day is 51 degrees F. *Hint: First find k.*

$T = 51^\circ$ $I_0 = 81$ So: $79 = 51 + (81-51)e^{-k \cdot 2}$

a) Being a pro-coffee drinker, Ms. Stilson drinks the coffee after waiting just 6 minutes. What is the temperature of the coffee?

$u(t) = 51 + (81-51)e^{-.0344(6)}$

$u(t) = 75.405\ ^\circ F$

↓

$79 = 51 + 30e^{-2k}$

$.933 = e^{-2k}$

$\ln .933 = -2k$

$k = .0344$

b) Mr. Ruback, with less hot coffee experience, wants to wait until the coffee is 70 degrees to drink it. How many minutes should he wait?

$70 = 51 + 30e^{-.0344t}$

$19 = 30e^{-.0344t}$

$.633 = e^{-.0344t}$

6. Chicago Cubs Bank is offering two different accounts to celebrate the Cubs winning the World Series. You have $1000 to invest for ten years. Determine which account will yield the most value for your investment and state how much more will it earn you over the other account. Please show all your work to support your answer.

Account #1: Compounded quarterly at an interest rate of 2.8%

Account #2: Compounded bimonthly (every other month) at an interest rate of 1.8%

(1) $A = 1000\left(1+\frac{.028}{4}\right)^{10.4}$

$A = \$1321.84$

(2) $A = 1000\left(1+\frac{.018}{6}\right)^{10.6}$

$A = \$1196.89$

Account 1 will yield the most interest

U4LT6 - I can investigate a scenario and create a regression model that best fits the data whether it be linear, exponential, or logarithmic.

1. During some great economic growth, Ireland was known as the Celtic Tiger. We will take a look at Ireland's GDP (gross domestic product). This is basically the value of all goods and services produced inside a country.

a. What regression would you use with this data? Exponential or logistic? Why?

Exponential because the GDP continues growing more rapidly every year.

(I used 60, 70, 80, etc)

Year	GDP (millions)
1960	1,939
1970	4,317
1980	21,002
1990	47,251
1995	67,921
2000	97,617
2005	202,930
2010	226,028

b. What is the exponential regression for this data?

$y = a \cdot b^x$

$y = 5.53 \cdot 1.10^x$

c. What can we project the GDP to be in year 2040?

$y = 5.53 \cdot 1.10^{140}$ ← 140 because I ~~sub~~ used

$y = 3{,}449{,}062$

d. The UK has the 6th highest GDP in the world today with 2,417,600 (in millions). When will Ireland have its neighbor's current GDP?

$2{,}417{,}600 = 5.53 \cdot 1.10^x$

$437179 = 1.10^x$

$\log_{1.10} 4317179 = x$

$x = 136$ years after 1900

So 2036

3. During 1845 – 1852, The Great Famine occurred in Ireland. A disease known as the potato blight caused the famine. The following is a table which represents the population of Ireland during and after this time.

Year	Population
1840	8,175,124
1850	6,552,385
1860	5,798,967
1870	5,412,377
1880	5,174,836
1890	4,704,750
1900	4,458,775
1910	4,390,219

a. Use exponential regression to find a model for the population during this time.

$y = 5720410447 \cdot .936^x$

b. Is this a growth or decay situation? How can you tell using the table? How can you tell using the equation?

~~It's~~ The population is decreasing, so it is decay.

$b < 1$ so it is decay

c. What will the population be in 2020 according to this model? Is this a good model to use for present time? Why or why not?

$y = 5720410447 \cdot .936^{220}$

$y = 2{,}742$

Probably not a good model because there is no longer a famine in Ireland.