Absorb what's in the exponent into the parenthesis

Name Schlansky Date ____________

Mr. Schlansky Algebra II

Equivalent Exponential Forms

1\. Iridium-192 is an isotope of iridium and has a half-life of 73.83 days. If a laboratory experiment begins with 100 grams of Iridium-192, the number of grams, A, of Iridium-192 present after t days would be $A = 100\left(\frac{1}{2}\right)^{\frac{t}{73.83}}$. Which equation approximates the amount of Iridium-192 present after t days?

1) $A = 100\left(\frac{73.83}{2}\right)^t$
2) $A = 100\left(\frac{1}{147.66}\right)^t$
3) ~~3)~~ $A = 100(0.990656)^t$
4) $A = 100(0.116381)^t$

$A=100\left(\frac{1}{2}\right)^{\frac{1}{73.83}t}$

$A=100\left(\frac{1}{2}^{\frac{1}{73.83}}\right)^t$

$A=100(.990655511\ldots)^t$

2\. A certain pain reliever is taken in 220 mg dosages and has a half-life of 12 hours. The function $A = 220\left(\frac{1}{2}\right)^{\frac{t}{12}}$ can be used to model this situation, where A is the amount of pain reliever in milligrams remaining in the body after t hours. According to this function, which statement is true?

$A=220\left(\frac{1}{2}\right)^{\frac{1}{12}t}$

$A=220\left(\frac{1}{2}^{\frac{1}{12}}\right)^t$

$A=220(.94387)^t$

1) Every hour, the amount of pain reliever remaining is cut in half. No, decrease by 6%.
2) In 12 hours, there is no pain reliever remaining in the body. NO
3) In 24 hours, there is no pain reliever remaining in the body. No
4) ~~4)~~ In 12 hours, 110 mg of pain reliever is remaining.

$A=220(.94387)^{12}=110$

3\. An equation to represent the value of a car after t months of ownership is $v = 32,000(0.81)^{\frac{t}{12}}$. Which statement is *not* correct?

1) ~~1)~~ The car lost approximately 19% of its value each month. No 2%
2) The car maintained approximately 98% of its value each month. ✓
3) The value of the car when it was purchased was \$32,000 ✓
4) The value of the car 1 year after it was purchased was \$25,920 ✓

12 months

$V=32,000(.98259\ldots)^{12}=25,920$

$V=32,000(0.81)^{\frac{1}{12}t}$

$V=32,000\left(0.81^{\frac{1}{12}}\right)^t$

$V=32,000(.98259\ldots)^t$

4\. The value of an investment account, $v(t)$ can be modeled by the equation $v(t) = 500(1.15)^{3.2t}$ after t years. Which of the following statements must be true?

1) The account is increasing approximately 15% each year. No, 56%
2) ~~2)~~ The account is increasing approximately 56% each year.
3) There will be \$1216.80 in the account after two years. $v(2) = 1223..$
4) It will take 3.68 years for the account to double. $v(3.68) = 2592$

$v(t) = 500(1.15)^{3.2t}$

$v(t) = 500\left(1.15^{3.2}\right)^t$

$v(t) = 500(1.5639868\ldots)^t$

Set them equal to each other and solve for r

5. The population, $p(t)$, of a small county in Western New York has grown according to the formula $p(t) = 6000(1.392)^{1.2t}$ after t years. When re-written in the form $p(t) = 6000e^{rt}$, what is the value of r rounded to the nearest thousandth?

$\frac{6000(1.392)^{1.2t}}{6000} = \frac{6000e^{rt}}{6000}$

$\ln 1.392^{1.2t} = \ln e^{rt}$

$\frac{1.2t \ln 1.392}{t \ln e} = \frac{rt \ln e}{t \ln e}$

$.397 = r$

6. The value of an investment account, $v(t)$, can be modeled by the formula $v(t) = 10000(.875)^{1.04t}$ after t years. When written in its equivalent form, $v(t) = 10000e^{rt}$, what would be the value of r rounded to the nearest tenth of a percent? Interpret the meaning of this value in the context of the problem.

$\frac{10000(.875)^{1.04t}}{10000} = \frac{10000e^{rt}}{10000}$

$\ln .875^{1.04t} = \ln e^{rt}$

$\frac{1.04t \ln .875}{t \ln e} = \frac{rt \ln e}{t \ln e}$

$-.138 = r$

$-.138 \cdot (100) = -13.9\%$

The investment is decreasing by 13.9% each year.

7. The half-life of iodine-131 is 8 days. The percent of the isotope left in the body d days after being introduced is $I = 100\left(\frac{1}{2}\right)^{\frac{d}{8}}$. When this equation is written in terms of the number e, the base of the natural logarithm, it is equivalent to $I = 100e^{kd}$. What is the approximate value of the constant, k?

1) −0.087
2) 0.087
3) −11.542
4) 11.542

$\frac{100\left(\frac{1}{2}\right)^{\frac{d}{8}}}{100} = \frac{100e^{kd}}{100}$

$\ln \frac{1}{2}^{\frac{d}{8}} = \ln e^{kd}$

$\left(\frac{d}{8} \ln \frac{1}{2}\right) = (kd \ln e)8$

$\frac{d \ln \frac{1}{2}}{8d \ln e} = \frac{8kd \ln e}{8d \ln e}$

$-.087 = k$

8. According to a pricing website, Indroid phones lose 58% of their cash value over 1.5 years. Which expression can be used to estimate the value of a \$300 Indroid phone in 1.5 years?

1) $300e^{-0.87}$
2) $300e^{-0.63}$
3) $300e^{-0.58}$
4) $300e^{-0.42}$

$A = P(1-r)^t$

$A = 300(1-.58)^t$

$A = 300(.42)^t$

$\frac{300(.42)^t}{300} = \frac{300e^{rt}}{300}$

$\ln .42^t = \ln e^{rt}$

$\frac{t \ln .42}{t \ln e} = \frac{rt \ln e}{t \ln e}$

$-.87 = r$