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Algebra II

Equivalent Exponents Forms

Express each of the following functions with an exponent of *t*. Round values to the nearest thousandth.

1. $A = 12{,}000(1.025)^{12t}$

$A=12{,}000(1.025^{12})^t$
$A=12{,}000(1.345)^t$

2. $A = 25{,}000(1.125)^{13.2t}$

$A=25{,}000(1.125^{13.2})^t$
$A=25{,}000(4.734)^t$

3. $A = 37{,}000(.986)^{10t}$

$A=37{,}000(.986^{10})^t$
$A=37{,}000(.868)^t$

4. $A = 17{,}000(.889)^{9.4t}$

$A=17{,}000(.889^{9.4})^t$
$A=17{,}000(.331)^t$

5. $A = 9{,}175(1.885)^{\frac{1}{2}t}$

$A=9175(1.885^{\frac{1}{2}})^t$
$A=9175(1.373)^t$

6. $A = 9{,}325(1.762)^{\frac{2}{5}t}$

$A=9325(1.762^{\frac{2}{5}})^t$
$A=9325(1.254)^t$

7. $A = 11{,}185(.764)^{\frac{t}{12}}$

$A=11{,}185(.764^{\frac{1}{12}})^t$
$A=11{,}185(.978)^t$

8. $A = 125{,}000(.785)^{\frac{t}{4}}$

$A=125000(.785^{\frac{1}{4}})^t$
$A=125000(.941)^t$

9. 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?

$A=100(\frac{1}{2}^{\frac{1}{73.83}})^t$
$A=100(.990656)^t$

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

2) $A = 100\left(\frac{1}{147.66}\right)^t$

3) $A = 100(0.990656)^t$

4) $A = 100(0.116381)^t$

10. 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?

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

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

$\frac{1.2\cancel{t} \ln 1.392}{\cancel{t}} = \frac{r\cancel{t}\cancel{\ln e}}{\cancel{t}}$

$1.2 \ln 1.392 = r$

$.397 = r$

11. 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.

$\frac{\cancel{10{,}000}(.875)^{1.04t}}{\cancel{10{,}000}} = \frac{\cancel{10{,}000}e^{rt}}{\cancel{10{,}000}}$

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

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

$1.04 \ln .875 = r$

$100(-.138) = r$

$-13.9\% = r$

The investment is decreasing by 13.9% each year.

12. 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

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

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

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

$\frac{\cancel{d} \ln \frac{1}{2}}{8\cancel{d}} = \frac{\cancel{8}k\cancel{d}}{\cancel{8d}}$

$-.087 = k$

13. 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) $300e^{-0.42}$

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

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

$A = 300(.42)^t$

$A = Pe^{rt}$

$A = 300e^{rt}$

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

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

$\frac{\cancel{t}\ln .42}{\cancel{t}} = \frac{r\cancel{t}\cancel{\ln e}}{\cancel{t}}$

$\ln .42 = r$

$-.867 = r$