$y = a(b)^t$

More Applications of Exponential Functions

EX1) The half-life of radium-226 is 1620 years. What percentage of a given amount of the radium will remain after 700 years? After 3000 years?

y: ?
a: 1
b: 0.5
t: $\frac{700}{1620} = 0.432\ldots$

$y = 1(.5)^{0.432\ldots}$

$y = 0.741$

74.1%

$y = 1(.5)^{1.85\ldots}$

$y = 0.277$

27.7%

t: $\frac{3000}{1620} = 1.85\ldots$

EX2) The half-life of radon-222 is 3.8 days. Your sample is useless to you after 80% has decayed. How many days is your sample useful to you?

y: 0.2
a: 1
b: 0.5
t: ?

$1 - .80 = .20$

$.2 = 1(.5)^t$

$\log_{.5} .2 = t$

$t = 2.322 \cdot 3.8 =$ 8.823 days

EX3) A population of 60 roaches increases exponentially. After 20 days, there are 432 roaches. How many roaches will there be after 52 days?

y: 432
a: 60
b: ?
t: 20

$\frac{432}{60} = \frac{60(b)^{20}}{60}$

$\sqrt[20]{7.2} = \sqrt[20]{b^{20}}$

$b = 1.103\ldots$

$y = 60(1.103\ldots)^{52}$

$y = 10{,}167.537\ldots$

10,168 roaches