Mathematics 122

Quiz #5 Name: Key

You must show your work to get full credit.

1. The half life of carbon-14 is 5730 years. If a sample of wood from an archaeological site has 30% of its carbon-14 left, then how old is it?

If A_0 is the initial amount, then

$A(t) = A_0 a^t$

We know $A(5730) = A_0 a^{5730} = .5 A_0$

$a^{5730} = .5$

$a = (.5)^{(1/5730)} = .9998790$

We now solve $A(t) = A_0 (.9998790)^t = .3 A_0$

$(.9998790)^t = .3$

$t \ln(.9998790) = \ln(.3)$

$t = \ln(.3)/\ln(.9998790)$

$= 9952.8$

Its age is: 9952.8 years

2. The weight, W, of a pine tree is proportional to the cube of its height h. A pine tree that is 6 feet tall weighs 75 pounds.

(a) What is the formula for the weight of a tree that is h feet tall?

$W = k h^3$ for some k.

To find k solve

$75 = k(6)^3$

$k = \frac{75}{6^3} = .34722$

$W = .3472 h^3$

(b) How much does a tree that is 90 feet tall weight?

Use $h = 90$ in the last formula

$W = (.3472) 90^3$

$= 253125$

It weight is 253125 lbs