Math 120 B | Quiz 4 (20 minutes) | May, the Fourth, 2016

Name: Key

Answer the questions in the spaces provided. If you run out of room for an answer, continue on the back of the page. Round to 3 decimal places.

1. Exponential decay is often measured in a unit called a *half life*, which is the time required for the amount of something to fall to half its initial value.

(a) Radon-222 is a radioactive isotope with a half life of 3.8 days. Recently, scientists discovered dangerous amounts of Radon-222 in the air of a building, at levels of 1.27 grams. Write an exponential model for the amount of Radon-222 in the building t days after its initial discovery. (Hint: You only need 8 points to determine an exponential function)

8

$f(x) = Ab^x$

$1.27 = f(0) = Ab^0 = A$

After 1 half-life

$0.635 = f(3.8) = 1.27b^{3.8}$

$b^{3.8} = \frac{1}{2}$

$b = 0.833$

$f(x) = 1.27(0.833)^x$

OR

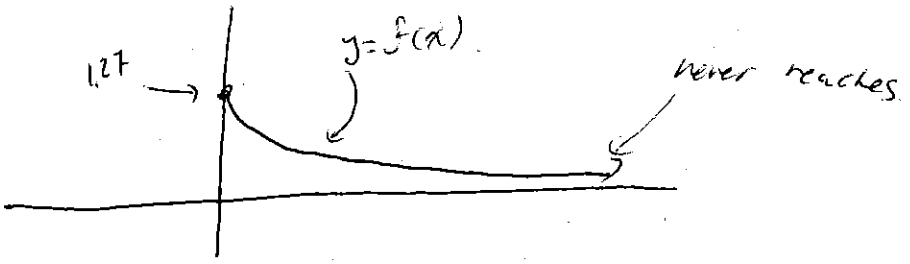
$f(x) = 1.27\left(\frac{1}{2}\right)^{x/3.8}$

initial; what happens each half life; time for half life

(b) If no amount of Radon-222 is considered safe, will the building ever be safe again? Why or why not?

4

No.



(c) Instead, we will call the building safe once the amount of Radon-222 falls below a nanogram (10^{-9} grams). When will we be able to safely reenter the building?

8

When does $f(x) = 10^{-9}$

$1.27(.833)^x = 10^{-9}$

$(.833)^x = \frac{10^{-9}}{1.27}$

$x = \log_{.833}\left(\frac{10^{-9}}{1.27}\right) = \frac{\ln(10^{-9}) - \ln(1.27)}{\ln(.833)}$

$= 114.722$