

MATH 1010-2: QUIZ 11
December 2, 2010
NO CALCULATORS ALLOWED.

1. (5 points) A radioactive element has a half-life of 30 years. After t years, 16 grams of the substance will have decayed to a mass of

$$m(t) = 16 \left(\frac{1}{2} \right)^{t/30}.$$

How many grams of the substance are left after 90 years?

Solution. We plug in $t = 90$ in the equation for m ,

$$\begin{aligned} m(90) &= 16 \left(\frac{1}{2} \right)^{90/30} \\ &= 16 \left(\frac{1}{2} \right)^3 \\ &= 16 \left(\frac{1^3}{2^3} \right) \\ &= 16 \left(\frac{1}{8} \right) \\ &= 2. \end{aligned}$$

So the answer is 2 grams.

2. (5 points) A positive number has the property that its square is equal to itself plus 56. What is the number?

Solution. Let x be the number. The problem tells us that

$$x^2 = x + 56.$$

This is a quadratic equation. One way to solve it is to bring everything to the left side,

$$x^2 - x - 56 = 0,$$

and then recognize that it factors as

$$(x + 7)(x - 8) = 0.$$

So either $x = -7$ or $x = 8$. Since the problem tells us that the number is positive, we conclude that $x = 8$.