

**Quiz 11 - Math 152**

Radon-20 is a radioactive substance, whose mass follows the equation

$$m(t) = m_0 e^{rt}$$

for some constant  $r$ , where  $m_0$  is the initial mass. 3 days ago I started out with 100g of Radon-20, and now there is only 40g left.

- (a) What is  $r$ ?  
 (b) What is the half-life of Radon-20?

**Solutions.**

- (a) We know that  $m(t) = 40$ ,  $m_0 = 100$ , and  $t = 3$ . Hence, we plug in:

$$\begin{aligned} 40 &= 100e^{3r} \\ .4 &= e^{3r} \\ r &= \frac{\ln .4}{3} \\ r &= -.305 \end{aligned}$$

- (b) We need to solve the equation

$$\frac{1}{2}m_0 = m_0 e^{rt}$$

for  $t$ . So we have

$$\begin{aligned} \frac{1}{2} &= e^{rt} \\ t &= \frac{\ln \frac{1}{2}}{r} \\ t &= \frac{\ln \frac{1}{2}}{-.305} \\ t &= 2.27 \end{aligned}$$

So the half-life of Radon-20 is approximately 2.27 days.