Description (5 points) Selected solutions from Assignments 31–32, §5.7–5.8.

**§5.7 Compound Interest**

11. $100 is invested at 10% compounded continuously. After a period of $2 \frac{1}{4}$ years what is the value of the investment.

Solution: Simply plug into the formula $A = Pe^{rt}$, for $P = 100$, $r = 0.10$ and $t = 2.25$. Let’s do it!

$$A = Pe^{rt} = (100) e^{(0.10)(2.25)} \approx \$125.23$$

20. Find the principal needed to get $800 after $2 \frac{1}{2}$ years at 8% compounded continuously.

Solution: Simply plug into the formula $P = Ae^{-rt}$, for $A = 800$, $r = 0.08$ and $t = 2.5$. Let’s do it!

$$P = Ae^{-rt} = (800) e^{-(0.08)(2.5)} \approx \$654.98$$

36. How many years will it take for an initial investment of $25,000 to grow to $80,000. Assume the interest rate of interest of 6% compounded continuously.

Solution: We base this solution on the continuous compounding formula $A = Pe^{rt}$. Here $P = 25,000$, $A = 80,000$ and $r = 0.07$. We substitute this data into the formula and solve for $t$.

$$A = Pe^{rt} \implies 80000 = (25000) e^{0.07t} \quad \text{subst data into formula}$$

$$\implies e^{0.07t} = \frac{80000}{25000} \quad \text{transpose and divide by 25000}$$

$$\implies 0.07t = \ln(16/5) \quad \text{take logs and simplify rational number}$$

$$\implies t = \frac{\ln(3.2)}{0.07} \quad \text{solve for } t, \text{ convert to decimal number}$$

$$\implies t \approx 16.62 \text{ (years)}$$

**§5.8 Exponential Growth and Decay**

3. Given the model $A(t) = 500 e^{-0.0244t}$, answer each of the following questions.

(a) What is the decay rate of strontium 90? Answer: $-2.44\%$

(b) How much strontium 90 was left after 10 years?

Solution: We have, $A(t) = 500 e^{-0.0244t}$ and the question asks what is $A(10)$. Indeed,

$$A(10) = 500 e^{-0.0244(10)} \approx 391.74$$
(c) When will 400 grams of strontium 90 be left?

Solution: We ask the question: What is the value of $t$, such that $A(t) = 400$. We set up the equation and solve for $t$.

$$A(t) = 400 \implies 500 e^{-0.0244t} = 400$$ subst in for $A(t)$

$$\implies e^{-0.0244t} = \frac{400}{500}$$ divide by 500

$$\implies -0.0244t = \ln(0.8)$$ take logs of both sides

$$\implies t = \frac{\ln(0.8)}{-0.0244}$$ solve for $t$

$$\implies t \approx 9.145 \text{ years}$$

(d) What is the half-life of strontium 90?

Solution: Set up the equation $250 = 500 e^{-0.0244t}$ and once again solve for $t$.

$$A(t) = 400 \implies 500 e^{-0.0244t} = 250$$ subst in for $A(t)$

$$\implies e^{-0.0244t} = \frac{250}{500}$$ divide by 500

$$\implies -0.0244t = \ln(0.5)$$ take logs of both sides

$$\implies t = \frac{\ln(0.5)}{-0.0244}$$ solve for $t$

$$\implies t \approx 28.40 \text{ years}$$

Each problem has something to teach you. Every time you pass up a problem, you lose that lesson. The cumulative effect of skipping problems over a lifetime is catastrophically equivalent to global warming!