

Section 5.6: Applications

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10:54 AM

we'll look at 4 different applications:

① compound interest

$$A = P \left(1 + \frac{r}{n} \right)^{nt}$$

compounding with
 n periods per
year

$$A = Pe^{rt}$$

compounding
continuously

② exponential growth

$$A = A_0 e^{rt}$$

$$P = P_0 e^{rt}$$

} either

where $A_0 =$ initial population at $t=0$

③ exponential decay

$$A = A_0 e^{-rt}$$

with $r > 0$

$$A = A_0 e^{rt}$$

with $r < 0$

} either

④ Newton's Law of Cooling (handout)

example:

Alanna invests a certain amount at 4% per year, compounded semi-annually. How long does it take for her investment to triple?

↑
every six months

$$A = P \left(1 + \frac{r}{n} \right)^{nt}$$

$$3P = P \left(1 + \frac{0.04}{2} \right)^{2t}$$

← divide both sides by P

$$3 = (1.02)^{2t}$$

method ①:

$$\log 3 = \log (1.02)^{2t}$$

$$\log 3 = 2t \log 1.02$$

$$t = \frac{\log 3}{2 \log 1.02}$$

$$\approx 27.7 \text{ years}$$

method ②:

$$\log_{1.02} 3 = 2t$$

$$t = \frac{\log_{1.02} 3}{2}$$

$$= \frac{1}{2} \cdot \frac{\log 3}{\log 1.02}$$

etc.

It takes 27.7 years for her investment to triple.