

Exercise 7.11

1. Anne invests €5000 in a fixed-term account paying 0.6% per month compound interest. Find
- the money in Anne's account after
 - 1 month
 - 2 months
 - 3 months
 - a formula for the amount Anne has saved after t -months
 - the minimum time for which Anne needs to invest her money if she wants to double her money.

<p>(i)</p> $F = P(1+i)^t$ <p>$F = ?$ $P = €5000$ $i = 0.6\%$</p>	$F_1 = 5000 (1 + 0.6\%)^1 = 5030.00$ $F_2 = 5000 (1.006)^2 = 5060.18$ $F_3 = 5000 (1.006)^3 = 5090.54$
<p>(ii)</p> <p>Formula</p>	$F_t = P(1+i)^t$ $F_t = 5000(1.006)^t$
<p>(iii)</p> <p>Time to double</p> <p>If $F = 2(5000)$ $= 10000$ $t = ?$</p>	$10000 = 5000 (1.006)^t$ $1.006^t = \frac{10000}{5000} = 2$ $t = \log_{1.006} 2 \approx 116 \text{ months}$

2. A biologist puts 100 bacteria into a controlled environment at the start of an experiment. Six hours later, she returns and counts 450 bacteria in the colony. Assuming exponential growth of the form $y = Ae^{bt}$ where b is the growth constant, find a value for b , correct to two decimal places.

<p>$t=0, y=100$</p>	$y = Ae^{bt}$ $100 = Ae^{b(0)} \Rightarrow \boxed{100 = A}$
<p>$t=6, y=450$</p>	$y = 100 e^{bt}$ $450 = 100 e^{b(6)}$ $4.5 = e^{6b}$
<p>$x^n = y \Leftrightarrow n = \log_x y$</p>	$6b = \log_e 4.5$
<p>"ln" = "log_e"</p>	$6b = 1.504$ $b = 1.504/6 \Rightarrow \boxed{b \approx 0.25}$
<p>Formula</p>	$\boxed{y = 100 e^{t/4}}$