Solutions version 5000

① $P = 5000$

$r\ \% \ 3.9\%$

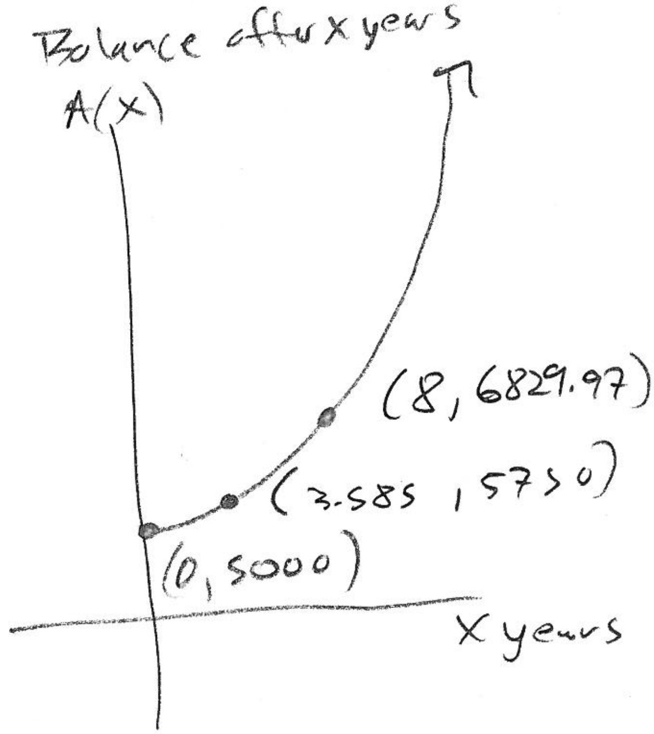
$r = 0.039$

$n =$ weekly

$n = 52$

Model

$$\boxed{A(x) = 5000\left(1+\frac{0.039}{52}\right)^{52x}}$$



② What is Account balance in 8 years?

$$A(8) = 5000\left(1+\frac{0.039}{52}\right)^{52\cdot 8}$$

$$= 5000\left(1+\frac{0.039}{52}\right)^{416}$$

$$= 5000(1.00 \qquad)^{416}$$

$$\approx$$

③ When will the population reach 5750?

$A(x) = 5750$

$$5750 = 5000\left(1+\frac{0.039}{52}\right)^{52x}$$

$$\frac{5750}{5000} = \frac{5000\left(1+\frac{0.039}{52}\right)^{52x}}{5000}$$

$$\frac{5750}{5000} = \left(1+\frac{0.039}{52}\right)^{52x}$$

$$\log_{\left(1+\frac{0.039}{52}\right)}\left(\frac{5750}{5000}\right) = 52x$$

$$x = \frac{\log_{\left(1+\frac{0.039}{52}\right)}\left(\frac{5750}{5000}\right)}{52} \approx$$

OR

$$\log\left(\frac{5750}{5000}\right) = \log\left(1+\frac{0.039}{52}\right)^{52x}$$

$$\log\left(\frac{5750}{5000}\right) = 52x\log\left(1+\frac{0.039}{52}\right)$$

$$\frac{\log\left(\frac{5750}{5000}\right)}{52\log\left(1+\frac{0.039}{52}\right)} = \frac{52x\log\left(1+\frac{0.039}{52}\right)}{52\log\left(1+\frac{0.039}{52}\right)}$$

$$x = \frac{\log\left(\frac{5750}{5000}\right)}{52\log\left(1+\frac{0.039}{52}\right)}$$

Solutions version 5000

$$A(x) = 5000\left(1+\frac{0.0072}{12}\right)^{12x}$$

$n=12$

Initial Investment

$r=0.072$

$n=12$

$\boxed{P=5000}$ (5)

$\boxed{\begin{array}{l} r=0.072 \\ r\% = 100r = 7.2\% \end{array}}$ (4)

$\boxed{\begin{array}{l} n=12 \\ n=\text{monthly} \end{array}}$ (6)

#7 If you keep initial investment = 5000 and $r=0.072$ but change n to quarterly

$n=4$

<u>New Model</u> $\boxed{A(x) = 5000\left(1+\frac{0.072}{4}\right)^{4x}}$

monthly model

Solutions version 5000

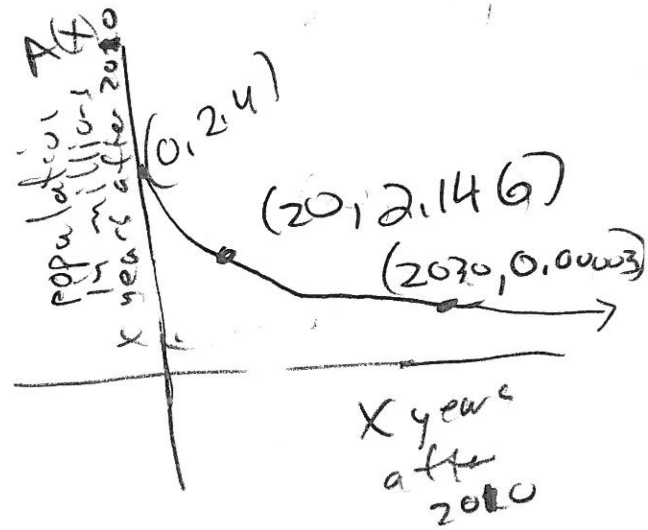
$$A(x) = 2.4e^{-0.0056x}$$

$x \rightarrow$ years after 2010

2.4: Initial Population 2.4 million

$A(x)$: Population x years after 2010

$$\boxed{\begin{aligned} r &= 0.0056 \\ 100r &= 0.56\% \\ r\% &= 0.56\% \end{aligned}}$$ #11



note

$x = 0$ year 2010

$x = 20$ year $2010 + 20 = 2030$

$x = 2030$ year $2010 + 2030$

year 4040

#12 When will this population reach 1500000?

Which equation? $\frac{1500000}{1000000} = 1.5$ million

So $1.5 = 2.4e^{-0.0056x}$

Why is $1500000 = 2.4e^{-0.0056x}$ wrong?

1,500,000 in this model is actually $1500000 \cdot 1000000 =$ 1500000000000

Solutions 5000 version

$A(x) = 2.4 e^{-0.0056x}$ → years since 2010

$A(x)$: population x years after 2010

2.4: 2.4 million initial population

$r = 0.0056$

$r\% = 0.56\%$

So $A(2030)$ means population 2030 years after 2010 or
population at 2010 + 2030
4040 year

$A(2030) = 2.4 e^{-0.0056(2030)}$

#13 $= 2.4e^{-}$

≈ 0.0000277 → 0.0000277 million

this is the population in year 4040

$A(20)$ means Population 20 years after 2010
or $2010 + 20 = 2030$
year 2030

#14 $A(20) = 2.4 e^{-0.0056(20)}$

$= 2.4e^{-}$

≈ 2.146 → 2.146 million

#15 Population in 2030 is approximately 2.146 million and decreasing