#3 Exponential growth/decay:

$P(t) = \cancel{a} \cdot b^t$ /100 $\quad Y = a \cdot b^x$

12000

$b = 1 + r = 1 + 2.3\%$

$b = 1 + 0.023 = 1.023$

(a) $\boxed{P(t) = 12000(1.023)^t}$

(b) $P = 12000(1.023)^{3.5} = 12994$

[13000]

(c) P_2

$\frac{20000}{12000} = \frac{12000(1.023)^t}{12000}$

exponential equation

$5/3 = 1.023^t$

$a \ln b = \ln b^a$

$\frac{\ln 5/3}{\ln 1.023} = \frac{t \cdot \ln 1.023}{\ln 1.023}$

$t = 22.5$ years

$a \cdot b^t$

#9(a) $\boxed{P(t) = 5000(0.985)^t}$

↑ less than 1 (decay)

$b = 1 + r$

$= 1 + -1.5\%$

$= 1 - 0.015$

$= 0.985$

(b) $P(2) = 5000(0.985)^2 = 4851$

*(c) $4000 = 5000(0.985)^t$

$4/5 = 0.985^t$

$\frac{\ln 4/5}{\ln 0.985} = \frac{t \cdot \ln 0.985}{\ln 0.985}$

$\boxed{t = 14.8 \text{ years}}$

HW quiz 11-8-18

(1) A population of 5680 is growing by 2.7% per year. Predict the population in 10 years to the nearest whole number. Show your equation.

(2) A population is described by $P(t) = 10000\,(1.06)^t$. How long will take this population to double?

More Population Problems

Ex. Six years ago, the pop. of a town was 12700. Today it is 14640.

(a) Find the rate of growth

(b) Predict the pop. 5 years from now.

(c) How long will it take for the pop. to reach 16000?

$P(t) = 12700 \cdot b^t$ Let $t = 0 \leftrightarrow$ 6 yrs ago

plug in an ordered pair: (t, P) $(6, 14640)$

$$\frac{14640}{12700} = \frac{12700 \cdot b^6}{12700}$$

$(a^m)^n = a^{mn}$

$$\left(b^6\right)^{\frac{1}{6}} = (1.152755)^{1/6}$$

$$b = 1.02398$$

$$\boxed{P(t) = 12700(1.02398)^t}$$

(a) growth rate $1.02398 = 1 + r$

$0.02398 = r$

$\boxed{2.398\% \text{ per year}}$

(b) $P(5) = 12706\,(1.02398)^{11}$ ↑ 5 yrs from now

$= 16482$

(c) $16000 = 12700(1.02398)^t$

$\ln 1.2598 = \ln 1.02398^t$

$$t = \frac{\ln 1.2598}{\ln 1.02398}$$

HW #7, 10, 11