Exercise 302

An investment is compounded monthly, quarterly, or yearly and is given by the function $A = P\left(1 + \frac{j}{n}\right)^{nt}$, where A is the value of the investment at time t, P is the initial principle that was invested, j is the annual interest rate, and n is the number of time the interest is compounded per year. Given a yearly interest rate of 3.5% and an initial principle of \$100,000, find the amount A accumulated in 5 years for interest that is compounded a. daily, b., monthly, c. quarterly, and d. yearly.

[TYPO: Replace "time" with "times."]

Solution

Assign values to each of the variables.

$$\begin{aligned} P \text{ is the initial principle that was invested} &\quad\Rightarrow\quad P = 100{,}000 \\ j \text{ is the annual interest rate} &\quad\Rightarrow\quad j = 0.035 \\ \text{find the amount } A \text{ accumulated in 5 years} &\quad\Rightarrow\quad t = 5 \end{aligned}$$

Part (a)

If the interest is compounded daily, then it compounds 365 times per year: $n = 365$.

$$A(5) = 100{,}000\left(1 + \frac{0.35}{365}\right)^{365(5)} \approx 574{,}977.94$$

Part (b)

If the interest is compounded monthly, then it compounds 12 times per year: $n = 12$.

$$A(5) = 100{,}000\left(1 + \frac{0.35}{12}\right)^{12(5)} \approx 561{,}232.35$$

Part (c)

If the interest is compounded quarterly, then it compounds 4 times per year: $n = 4$.

$$A(5) = 100{,}000\left(1 + \frac{0.35}{4}\right)^{4(5)} \approx 535{,}285.29$$

Part (d)

If the interest is compounded yearly, then it compounds 1 time per year: $n = 1$.

$$A(5) = 100{,}000\left(1 + \frac{0.35}{1}\right)^{1(5)} \approx 448{,}403.34$$