

Answer on Question #59741 – Math – Calculus

Question

Continuous Money Flow. Find the total income in 8 years by a continuous money flow with a rate of $f(t) = e^{0.06t}$ and the present value in 8 years with $r = 10\%$.

Solution

Total money flow is basically total income. The total money flow over the time interval $x = 0$ to $x = t$ is given by

$$\int_0^t f(x)dx.$$

Thus, the total income in 8 years by a continuous money flow is

$$\int_0^8 f(t)dt = \int_0^8 e^{0.06t} dt = \frac{1}{0.06} (e^{0.06t})_0^8 = \frac{1}{0.06} (e^{0.48} - 1) = 10.27.$$

The present value in 8 years with $r = 10\%$ is

$$\begin{aligned} P &= \int_0^8 f(t)e^{-rt} dt = \int_0^8 e^{0.06t} e^{-0.1t} dt = \int_0^8 e^{-0.04t} dt = \frac{1}{-0.04} \int_0^8 e^{-0.04t} d(-0.04t) = \frac{1}{-0.04} (e^{-0.04t})_0^8 = \\ &= \frac{1}{0.04} (1 - e^{-0.32}) = 6.85. \end{aligned}$$

Answer: Total income=10.27. Present value=6.85.