7.4 Section Continuous Income Streams

Formula: Total Value = \( \int_{a}^{b} R(t) \, dt \)

**Example #4**

\( R(t) = 300 + 4.5t - 0.05t^2 \)

**Step 1**

\( TV = \int_{0}^{92} (300 + 4.5t - 0.05t^2) \, dt \)

\( \uparrow \)

\( \text{bc}(0 \leq t \leq 92) \)

**Step 2**

Is downward parabola \( -0.05t^2 \)

**Step 3**

Put in calculator to solve

\( = \$33,466.66 \) income for shop during open months
Present Value / Future Value

Future Value Formula:
\[ FV = \int_{a}^{b} R(t)e^{r(b-t)} \, dt \]

*How much money will be in account @ end of certain time. (@ time \( t=b \))

\( r = \) rate
\( t = \) variable
\( R(t) = \) Revenue
\( b = \) ending days
\( a = \) starting day

Ex #5: \( R(t) = 300 + 4.5t - 0.05t^2 \) \( (0 \leq t \leq 92) \)

\( r = 5\% = 0.05 \)
\( a = 0 \) \( b = 92 \)

Plug into formula:
\[ \int_{0}^{92} (300 + 4.5t - 0.05t^2)e^{0.05(92-t)} \, dt \]

*Plug into calculator = $33,880.00  
Ending amount
Present Value \( (t=a) \) * how much is it worth now?

Formula: \[ PV = \int_{a}^{b} R(t)e^{r(a-t)} \, dt \]

*Previous page states what variables mean

\[ PV = \int_{0}^{92} (300 + 4.5t - 0.05t^2)e^{0.05(0-t)} \, dt \]

Plug into calculator and find \( PV = \)

b/c 5% APR is annual, we need to convert to days, so \( \frac{0.05}{365} \) days

* I.e. If time is in days & interest rate in years you have to adjust to match.