5.6 Compound Interest

Ex1. Adriane purchased a new car for $18,000. The loan had a 5% interest rate for 5 years. Find the total amount she will pay after the 5 years.

This is simple interest so, \( I = Prt \)

\[ 5\% = 0.05 \quad I = 18,000 \times (0.05)(5) \]

\[ = 4,500 \]

Adriane will pay $18,000 + 4,500 which is $22,500 for the car.

You try... What is the simple interest on a loan for $15,700 at 5.5% for 3 years?

\[ I = 15,700 \times (0.055)(3) \]

\[ = 2,590.50 \]

$2,590.50 in interest for 3 years

Ex2. Nick invested $5,000 at 6%, compounded quarterly. How much will Nick have after 10 years?

Compounded so \( A = P \left(1 + \frac{r}{n}\right)^{nt} \)

\[ A = 5,000 \left(1 + \frac{0.06}{4}\right)^{4 \times 10} \]

\[ \approx 9,070.09 \]

After 10 years, Nick will have $9,070.09

You try... Marcy invested $1,250 at 3.5%, compounded monthly. How much will Marcy have after 8 years?

\[ A = 1,250 \left(1 + \frac{0.035}{12}\right)^{12 \times 8} \]

\[ \approx 1,541.63 \]

After 8 years, Marcy will have $1,541.63
Ex. 3 Jon invested $2000 at 5.5%. compounded continuously. How much will Jon have in his account after 20 years?

Compounded continuously so, \( A = Pe^{rt} \)
\[
\hat{A} = 2000e^{0.055(20)} = 6008.33
\]

After 20 years, Jon will have $6008.33.

You try... How much money will Sally need to invest initially in order to have $100,000 after 18 years if the money is compounded continuously at 8%?

\[
\frac{100000}{e^{0.08(18)}} = Pe^{0.08(18)}
\]

\[
P e^{23,692.78}
\]
Sally will need to invest about $23,692.78 to have $100,000.