

Worksheet 4C

- **Lump sum: (one-time payment)**

$$A = P(1 + i)^N$$

where P = principal, i = interest rate per compounding period, A = accumulated balance in N periods.

- **Annuity: (periodic payment)**

$$A = q \frac{(1 + i)^N - 1}{i}$$

where i = interest rate per compounding period, q = payment per period, A = accumulated balance in N periods.

- **Total return: gain in percentage = $\frac{\text{accumulated balance} - \text{amount you put in}}{\text{amount you put in}}$**

1. You deposit \$500 in an account with an APR of 3%. Suppose the interest is continuously compounded.
 - Find the APY.
 - How much will you have at the end of 1000 days?
 - At the end of 40 months?
 - At the end of 5 years?

2. You deposit \$300 per month in an investment plan that pays an APR of 3.5%.

- How much will you have paid in 18 years (in other words, what is your total deposit)?
- How much will you have in your account in 18 years? Round to the nearest dollar.
- What is the total return?

3. Consider two investment methods below.

Annuity: monthly deposit of \$200 at APR = 6%

Lump sum: one-time deposit of \$20,000 at APR = 5%

Find the total return (round to nearest percentage) for each investment method and decide which is better

- in 5 years
- in 10 years
- in 15 years

4. At age 25, you start saving for retirement. If your investment plan pays an APR of 4% and you want to have \$1 million when you retire in 40 years.

- How much must you deposit monthly? Round to the nearest dollar.
- At age 35, you get a well-paid job and start saving double the previous amount each month. How old will you be when you have \$1 million in saving?