

Math 111 Worksheet #10 Solutions

1. Find the effective rates of the following:

(a) 8% compounded annually

Quantities: $r = .08$, $k = 1$

Using the Effective Rate Formula for Compound Interest:

$$\text{Effective Rate} = \left(1 + \frac{.08}{1}\right)^1 - 1 = .08 \Rightarrow 8\%$$

This result should make sense because interest compounded annually at 8% is only given once a year, which makes the 8% also the effective rate.

(b) 8% compounded monthly

Quantities: $r = .08$, $k = 12$

Using the Effective Rate Formula for Compound Interest:

$$\text{Effective Rate} = \left(1 + \frac{.08}{12}\right)^{12} - 1 \approx .0829995 \Rightarrow 8.3\%$$

(c) 8% compounded continuously (Hint: Look at the formula for effective interest for compounding k times. What do you think changes for continuous compounding?)

Quantities: $r = .08$

The effective rate for continuous compounding will be given by

$$\text{Effective Rate} = e^r - 1 = e^{.08} - 1 \approx .083287 \Rightarrow 8.33\%$$

2. How much would you need to invest today to have \$2000 in an account giving 4% compounded continuously after 9 years?

Quantities: $A = 2000$, $P = ?$, $r = .08$, $t = 9$

Using the Continuous Compounding Formula, we have that $2000 = Pe^{.04(9)}$

$$2000 = Pe^{.36}$$

$$\Rightarrow P = \frac{2000}{e^{.36}} \approx \$1395.35$$

So, you would need to invest \$1395.35 today to have \$2000 after 9 years.

3. What is the future value of an investment that compounds quarterly at 11% if you deposit \$500 each quarter for 8 years?

Quantities: $S = ?$, $R = 500$, $r = .11$, $k = 4$, $t = 8$

Using the Ordinary Annuities Formula:

$$S = 500 \left(\frac{\left(1 + \frac{.11}{4}\right)^{4(8)} - 1}{\frac{.11}{4}} \right) = 500 \left(\frac{1.0275^{32} - 1}{.0275} \right) \approx \$25134.93$$

You will have \$25,134.93 after 8 years of investing \$500 per quarter.