3.6 Mathematics of Finance

Obj: 1. Use exponential fncs & eqs to solve business & financ applications.

Compound Interest

Compounded Annually:

$$A = P(1+r)^n$$

A: total amt.
P: principal (initial amt of $)
r: interest rate (decimal)
n: time (# of yrs)

Nov 29-9:10 AM

$500 invested at 7% comp. annually. Find value after 10 yrs.

$$A = P(1+r)^n$$
$$A = 500(1+.07)^{10}$$
$$= 983.58$$

Nov 29-9:59 AM

Compounded K times per year:

$$A = P\left(1 + \frac{r}{K}\right)^{Kt}$$

A: final amt.

P: principal

r: rate

K: # of times compounded per yr.

t: # of yrs.

Nov 29-10:04 AM

$500 invested at 9% compounded monthly. Find value after 5 yrs.

$$A = P\left(1 + \frac{r}{K}\right)^{Kt}$$

$$A = 500\left(1 + \frac{.09}{12}\right)^{(12 \cdot 5)}$$

$$\approx 782.84$$

Nov 29-10:08 AM

$500 invested at 9% compounded monthly.

How long until it reaches $3000?

$$A = P\left(1+\frac{r}{k}\right)^{kt}$$

$$\frac{3000}{500} = \frac{500\left(1+\frac{.09}{12}\right)^{12t}}{500}$$

$$\ln 6 = \ln 1.0075^{12t}$$

$$\ln 6 = 12t \cdot \ln 1.0075$$

$$\frac{\ln 6}{12\ln 1.0075} = \frac{12t\cdot\ln 1.0075}{12\ln 1.0075}$$

$$t \approx 19.98 \text{ yrs}$$

Nov 29-10:09 AM

$500 invested and compounded quarterly.

What interest rate do you need to have the investment double in 10 yrs?

$$A = P\left(1+\frac{r}{k}\right)^{kt}$$

$$\frac{1000}{500} = \frac{500\left(1+\frac{r}{4}\right)^{40}}{500}$$

$$\sqrt[40]{2} = \sqrt[40]{\left(1+\frac{r}{4}\right)^{40}}$$

$$1.01748 = 1+\frac{r}{4}$$

$$-1 \quad -1$$

$$4(.01748) = \left(\frac{r}{4}\right)4$$

$$r = .0699$$

6.99%

Nov 29-10:12 AM

Compounded Continuously

$$A = Pe^{rt}$$

A: final amt
P: principal
r: rate
t: time

Nov 29-10:16 AM

Invest $100 at 8% comp. continuously.
Find the value at the end of year
1, 2, 3, 4, 5, 6, 7.

$A = Pe^{rt}$

$A = 100e^{.08 \cdot 1} = 108.33$

$A = 100e^{.08 \cdot 2} = 117.35$

$A = 100e^{.08x}$ calc

Nov 29-10:18 AM