October 22

GUIDED NOTES: Compound Interest

Compounded over time period:

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

Compounded continuously:

$$A = Pe^{rt}$$

A: final amount

P: initial amount (principle)

r: interest rate (divide by 100)

n: number of times compounded in one year

t: time (in years only)

Compounded.....	n =
yearly, annually	1
semiannually	2
quarterly	4
monthly	12

EX1. What amount will an account have after $\underbrace{\text{5 years}}_{t}$ if $\underbrace{\text{\$75}}_{P}$ is invested at $\underbrace{8.5\%}_{r}$ interest compounded continuously?

$A = Pe^{rt}$

A: ?

P: 75

r: 8.5÷100 = .085

t: 5

$A = 75 \cdot e^{.085 \cdot 5}$

$\boxed{A = \$114.72}$

EX2. Find the amount owed at the end of $\underbrace{\text{9 years}}_{t}$ if $\underbrace{\text{\$5000}}_{P}$ is loaned at a rate of $\underbrace{6\%}_{r}$ interest compounded $\underbrace{\text{quarterly}}_{n}$.

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

A: ?

P: 5000

r: 6%÷100 = .06

n: 4

t: 9

$A = 5000\left(1+\frac{.06}{4}\right)^{4 \cdot 9}$

$\boxed{A = \$8545.70}$

EX3. Determine the amount that must be invested at 6% interest compounded monthly, so that $200,000 will be available for retirement in 20 years.

$A = P(1+\frac{r}{n})^{nt}$

A: 200000
P: ?
r: 6% ÷ 100 = .06
n: 12
t: 20

$200000 = P\left(1+\frac{.06}{12}\right)^{12 \cdot 20}$

$\frac{200000}{3.31} = \frac{P \cdot \cancel{3.31}}{\cancel{3.31}}$

$\boxed{\$60{,}419.23 = P}$

EX4. What amount invested at 7% interest compounded continuously for 4 years will yield $700?

yield - give out

$A = Pe^{rt}$

A: 700
P: ?
r: 7% ÷ 100 = .07
t: 4

$700 = P \cdot e^{.07 \cdot 4}$

$\frac{700}{1.32} = \frac{P \cdot \cancel{1.32}}{\cancel{1.32}}$

$\boxed{\$529.05 = P}$

EX5. If $600 is invested at 6% interest compounded continuously, how long will it take before the amount is $900?

EX6. How long does it take $1500 to double if it is invested at 6% interest compounded semiannually?