Geometric Series

$$a + ar + ar^2 + \cdots + ar^{n-2} + ar^{n-1}$$

Compound Interest

$$A(t) = P\left(1 + \frac{r}{m}\right)^{mt} = P(1+i)^n$$

r = APR

m = #periods/yr

t = #yrs

$i = \frac{r}{m}$

$n = mt$

ANNUITY

$R = Pmt$

$$R(1+i)^{n-1} + R(1+i)^{n-2} + \cdots + R(1+i)^3 + R(1+i)^2 + R(1+i) + R$$

Not APR

$$a + ar + ar^2 + \cdots + ar^{n-2} + ar^{n-1} = a\left(\frac{1-r^n}{1-r}\right)$$

1st term, common ratio

$$= R + R(1+i) + R(1+i)^2 + \cdots + R(1+i)^{n-2} + R(1+i)^{n-1}$$

$$= R\left(\frac{1-(1+i)^n}{1-(1+i)}\right) = R\left(\frac{1-(1+i)^n}{-i}\right)$$

$1-(1+i) = -i$

$$R\left(\frac{\left(1+\frac{r}{m}\right)^{mt} - 1}{\frac{r}{m}}\right) = R\left(\frac{(1+i)^n - 1}{i}\right)$$

Pmts of \$500/month @ APR of 4% for 5 years. What's the future value?

"Simple, ordinary annuity certain"

Pmt @ end of each period.

Same Pmt. Interest rate is fixed.

```
500((1+.04/12)^(
12*5)-1)/(.04/12
)
      33149.48909
500*12*5
          30000
```

≈ \$33,149.49

without any interest.