

## Math 105 Formula Sheet

### Simple Interest over Time:

$$I = P_0rt$$

$$A = P_0(1 + rt)$$

$I$  = the amount of interest earned.  
 $P_0$  = the initial investment amount (Principal)  
 $r$  = the interest rate, written as a decimal  
 $t$  = time, in years  
 $A$  = ending amount of the investment  
Note: We also had  $A = P + I$ , and  $A = P + Prt$

### Compound Interest:

$$P_N = P_0 \left(1 + \frac{r}{k}\right)^{Nk}$$

$P_N$  = ending amount of investment  
 $P_0$  = starting amount of investment (Principal)  
 $r$  = interest rate, written as a decimal  
 $k$  = number of compounding periods in a year  
 $N$  = # years

### Annuity Formula:

$$P_N = \frac{d \left( \left(1 + \frac{r}{k}\right)^{Nk} - 1 \right)}{\left(\frac{r}{k}\right)}$$

$P_N$  = ending amount of annuity (amount you save up over time).  
 $d$  = regular deposit amount  
same as above:  
 $r$   
 $N$   
 $k$  = same as the # deposits per year

### Payout Annuity Formula / Loans Formula:

$$P_0 = \frac{d \left(1 - \left(1 + \frac{r}{k}\right)^{-Nk}\right)}{\left(\frac{r}{k}\right)}$$

**Payout Annuity**  
 $P_0$  = starting amount of annuity (the amount you start retirement with)  
 $d$  = regular withdrawal amount

**Loan**  
 $P_0$  = loan amount  
 $d$  = regular loan payment