Chapter 10
Group Work

1.)

a.) Find 16 + 20 + 24 + … + 52 (10 terms)

[(16 + 52)*10]/2 = 340

b.) Find 3 + 13 + 23 + … + 193 (? terms)
We can see that d = 10.
$\frac{193 - 3}{d}$ + 1= 20, so 20 terms. Then the sum is [(3 + 193)*20]/2 = 1960

2.) A population grows according to the linear growth model. The starting population is $P_0 = 100$, and the common difference is d = 12.

a.) Find P_1 **= 100 + 1*d = 112**

b.) Find P_5 **= 100 + 5*d = 160**

c.) How many generations will it take for the population to exceed 200?

We start with 100. So we need 100 more. 100/12 = 8.33, so we must need to add 100 9 times to get over 200. (There are lots of ways to figure this out, this is just one of them.) Thus the answer is 9.

3.) A population grows according to the exponential growth model. The starting population is $P_0 = 1{,}000$, and the common ratio is r = 1.3. If the generations happen twice a year, what is the size of the population after 10 years? (Hint: N is not 10.)

$P_{20} = 1000 * (1.3)^{20} = 190049.6377$

What if the generations happened every other month? Then what would the population size be after 10 years?

$P_{60} = 1000 * (1.3)^{60} = 6864377173$

4.) You have $1000 that you wish to deposit for 10 years.
Bank A offers you a 10% interest rate compounded annually.
Bank B offers you a 9.75% interest rate compounded monthly.
Bank C offers you a 2% interest rate compounded annually, AND a free frisbee.

Which bank will you choose? Why?
Bank B. After 10 years, in the Bank A account you will have $1000*(1+0.1)^{10}$ = $2593.74.
In the Bank B account you will have $1000*(1+0.1/12)^{10*12}$ = $2640.74. so this is a better deal.
In the Bank C account you would have $1000*(1+0.02)^{10}$ = $1218.99.

5.) All of the populations below grow according to the logistic growth model. For each of them, find p_1 up to p_8, and give a prediction of what will happen to the population in the future.

Use the logistic equation (the first one on the formula sheet).

a.) $p_0 = 0.56$, $r = 3.3$

p0	0.56
r	3.3
p1	0.81312
p2	0.501454
p3	0.824993
p4	0.476452
p5	0.82317
p6	0.480351
p7	0.823726
p8	0.479165

We can see that the population will oscillate between about 82% and 48% of the carrying capacity.

b.) $p_0 = 0.35$, $r = 1.9$

p0	0.35
r	1.9
p1	0.43225
p2	0.466279
p3	0.472839
p4	0.473598
p5	0.473676
p6	0.473683
p7	0.473684
p8	0.473684

We can see that the population seems to be stabilizing around 47.37% of the carrying capacity.

c.) $p_0 = 0.4$, $r = 0.75$

p0	0.4
r	0.75
p1	0.18
p2	0.1107
p3	0.073834
p4	0.051287
p5	0.036492
p6	0.026371
p7	0.019256
p8	0.014164

We can see that the population seems to be going to extinction.