NAME: ______________________________ **Panther ID:** ____________

Worksheet week 1 - MAC 2312, Fall 2014

1. (6 pts) Determine a formula for the general term a_n of the sequence and decide whether the sequence converges or diverges. Briefly justify each case.

(a) $a_1 = 1,\ a_2 = -1,\ a_3 = 1,\ a_4 = -1,\ ...$

(b) $a_0 = 1,\ a_1 = -\frac{2}{3},\ a_2 = \frac{4}{9},\ a_3 = -\frac{8}{27},\ ...$

(c) $a_1 = 1,\ a_2 = \frac{1}{2},\ a_3 = 1,\ a_4 = \frac{2}{3},\ a_5 = 1,\ a_6 = \frac{3}{4},\ ...$

2. (6 pts) In this problem you will prove (with Calculus) that the area of a circle of radius r is given by $A = \pi r^2$.

(a) Consider a regular pentagon inscribed in this circle and let A_5 denote the area of this pentagon. Find a formula for A_5 in terms of the radius r of the circle (of course, some factor involving $\sin(\pi/5)$ will also appear).
Hint: Using the center of the circle, divide the pentagon into 5 congruent triangles.

(b) Consider now a regular polygon with n-sides inscribed in this circle and let A_n denote the area of this pentagon. Following your reasoning in part (a), find a formula for A_n in terms of the radius r of the circle.

(c) Give an informal reason why $A = \lim_{n\to+\infty} A_n$ and then compute the limit to get the famous $A = \pi r^2$.