Math 261 Fall 2011
Assignment #6

This assignment is due at the beginning of class on Monday, November 7, 2011.

1. Use the files for Shamir's Secret Sharing to encode the word `BUBBLEGUM` to be shared among 6 people. In answering this problem, your solution will consist of a vector `y` which has 6 entries. Submit your solution both in hard copy and by sending me an email. Also mention if you are using OCTAVE or MATLAB to answer this problem. I also want you to "seed" the random number generator with your student number in order that I might easily reproduce your result. Use the command

```
> rand('seed',123456789)
```

where `123456789` is replaced by your student number to seed the random number generator before you run the secret programs. Be sure to re-seed to your student number if you run the program more than once.

2. The purpose of this problem is to lead you through the proof that

$$\sum_{k=1}^{\infty} \frac{(-1)^{k+1}}{k^2} = \frac{\pi^2}{12} \quad \text{and} \quad \sum_{k=1}^{\infty} \frac{1}{k^2} = \frac{\pi^2}{6}.$$

Let $f(x) = x^2$ for $-\pi \leq x \leq \pi$.

(a) Determine the Fourier series for f, namely

$$\frac{a_0}{2} + \sum_{k=1}^{\infty} (a_k \cos(kx) + b_k \sin(kx)).$$

(b) Assuming that

$$f(x) = \frac{a_0}{2} + \sum_{k=1}^{\infty} (a_k \cos(kx) + b_k \sin(kx)),$$

and substitute the value $x = 0$ into the equation to obtain

$$f(0) = \frac{a_0}{2} + \sum_{k=1}^{\infty} a_k.$$

Substitute the value $x = \pi$ into the equation to obtain

$$f(\pi) = \frac{a_0}{2} + \sum_{k=1}^{\infty} a_k \cos(k\pi).$$

Note that $\cos(k\pi) = (-1)^k$ for $k = 1, 2, \ldots$. If you have computed a_k and b_k correctly, then you should obtain the desired formulas.