

CS 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 \mathbf{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 $k = 1, 2, \dots$. If you have computed a_k and b_k correctly, then you should obtain the desired formulas.