

Math 354      Homework 2  
**Part 2 of 2**

Due at 10am Wednesday, January 30th

**Problem 1** Find both the Fourier cosine series and the Fourier sine series of the following functions on the interval  $(0, \pi)$ . But first, graph their even and odd extensions for  $\theta \in (-\pi, \pi)$  and then expand the domain even further to, say,  $\theta \in (-3\pi, 3\pi)$ .

a)  $f(\theta) = 1, \quad \theta \in (0, \pi)$ ;

b)  $f(\theta) = \cos \theta, \quad \theta \in (0, \pi)$ .

You can use identities such as

$$2 \cos \alpha \cos \beta = \cos(\alpha - \beta) + \cos(\alpha + \beta);$$

$$2 \cos \alpha \sin \beta = \sin(\alpha + \beta) - \sin(\alpha - \beta).$$

**Problem 2** Let the Fourier series of  $f(\theta)$  be given as

$$f(\theta) = \frac{1}{2}a_0 + \sum_1^{\infty} (a_n \cos n\theta + b_n \sin n\theta).$$

Find the Fourier series of  $\frac{1}{2}[f(\theta) + f(-\theta)]$  and  $\frac{1}{2}[f(\theta) - f(-\theta)]$ . Comment on your result.