

## Math 2080: Differential Equations

### Worksheet 6.1: Introduction to Fourier series

**NAME:**

1. Let  $\mathbf{n}_1 = \begin{bmatrix} \sqrt{2}/2 \\ \sqrt{2}/2 \end{bmatrix}$  and  $\mathbf{n}_2 = \begin{bmatrix} -\sqrt{2}/2 \\ \sqrt{2}/2 \end{bmatrix}$ . Write the vector  $\mathbf{v} = \begin{bmatrix} 3 \\ 4 \end{bmatrix}$  as  $\mathbf{v} = a_1\mathbf{n}_1 + a_2\mathbf{n}_2$ . That is, find  $a_1$  and  $a_2$ .

2. Find the Fourier series of the following functions *without* computing any integrals:

(a)  $f(x) = 2 - 3 \sin 4x + 5 \sin 6x$ , [*Hint*: Very simple, purely by inspection.]

(b)  $f(x) = \sin^2 x$ . [*Hint*: Use a standard trig identity.]