Math 2080: Differential Equations
Worksheet 6.1: Introduction to Fourier series

NAME:

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