Math 4600

Homework 2  
Due Feb. 12

Write your solutions in separate paper and clearly mark the problem number.

- Do the following problems from the text.
  1,2,6,7,13,15,25 in Section 2.5.
  3,7, 13,17,21,30 in Section 2.6.
  1, 5, 7 in Section 3.1.
  3, 7, 13, 16,17 in Section 3.2.

- We have seen dot product (inner product) between two vectors defined as
  $$(a_1, a_2, a_3) \cdot (b_1, b_2, b_3) = a_1 b_1 + a_2 b_2 + a_3 b_3$$

  Between two (reasonable) functions we can define an inner product
  $$f(x) \cdot g(x) = \int_{-\pi}^{\pi} f(x)g(x) \, dx$$

Compute the following integrals where $m, n$ are nonzero positive integers
and $m \neq n$.

$$\int_{-\pi}^{\pi} \cos(mx) \, dx$$

$$\int_{-\pi}^{\pi} \sin(mx) \, dx$$

$$\int_{-\pi}^{\pi} \cos(mx)\sin(nx) \, dx$$

$$\int_{-\pi}^{\pi} \cos(mx)\cos(nx) \, dx$$

$$\int_{-\pi}^{\pi} \sin(mx)\sin(nx) \, dx$$

The point is that \{1, \cos x, \sin x, \cos 2x, \sin 2x, \ldots\} are orthogonal set.