EE203001 Linear Algebra
Quiz #7 04/08/2003

1. In $\mathbb{R}^4$, let $x = (3, 0, 1, 0)$ and S be the subspace spanned by vectors $x_1 = (1, 0, 1, 0)$, $x_2 = (2, 3, 1, 1)$, and $x_3 = (1, -3, 2, -1)$. Find the projection of x on the subspace S.

2. In the real linear space $C(0, 2\pi)$ with inner product $(f, g) = \int_0^{2\pi} f(x)g(x)\,dx$, let $f(x) = 1 + 2x$. In the subspace spanned by $u_0(x) = 1$, $u_1(x) = \cos x$, and $u_2(x) = \sin x$, find the trigometric polynomial nearest to f.

3. In the real linear space $C(-1, 1)$ with inner product $(f, g) = \int_{-1}^{1} f(x)g(x)\,dx$, we have known the three normalized Legendre polynomials

$$\phi_0(x) = \sqrt{\frac{1}{2}}, \quad \phi_1(x) = \sqrt{\frac{3}{2}}x, \quad \phi_2(x) = \frac{1}{2}\sqrt{\frac{5}{2}}(3x^2 - 1),$$

form a orthonormal basis for the subspace S of dimension 3 consisting of all polynomials of degree ≤ 2. Let $f(x) = \sin \pi x$. Find the quadratic polynomial g nearest to f.