Math 524 Exam 9: 11/20/8

Please read the exam instructions.

Notes, books, papers, calculators and electronic aids are all forbidden for this exam. Please write your answers on **separate paper**, indicate clearly what work goes with which problem, and put your name on every sheet. Cross out work you do not wish graded; incorrect work can lower your grade, even compared with no work at all. Keep this list of problems for your records. Show all necessary work in your solutions; if you are unsure, show it. Each problem is worth 10 points. You have approximately 30 minutes.

The first two problems concern Euclidean $\mathbb{R}^3$. Let W be the subspace spanned by $u = (1, 0, 1)^T$ and $v = (1, 2, 3)^T$.

1. Write $x = (1, 1, 1)^T$ as the sum of an element of W and an element of $W^\perp$.

2. Find a basis for $W^\perp$.

3. Even quadratic polynomials are of the form $p(x) = \alpha x^2 + \beta$. Find the even quadratic polynomial that best fits (in the sense of least squares) the data $(0, 4), (1, -1), (2, 10)$.

4. Carefully state the definition of $\ell_2(\mathbb{R})$. Give two sample vectors.