Here are a couple of hints to Homework 18. Enjoy!

**SECTION 6.7: INNER PRODUCT SPACES**

6.7.1. Here  \( \langle x, y \rangle = 4u_1v_1 + 5u_2v_2 \)

6.7.5, 6.7.7. Here  \( \langle p, q \rangle = p(-1)q(-1) + p(0)q(0) + p(1)q(1) \). And  \( \|p\| = \sqrt{\langle p, p \rangle} \). Finally, remember that the formula for orthogonal projection remains the same, namely:

\[
\hat{q} = \frac{\langle q, p \rangle}{\langle p, p \rangle} p
\]

6.7.11. Here  \( \langle p, q \rangle = p(-2)q(-2) + p(-1)q(-1) + p(0)q(0) + p(1)q(1) + p(2)q(2) \).

If we let  \( p_3 = t^2 \), then we have:

\[
\hat{p}_3 = \frac{\langle p_3, p_0 \rangle}{\langle p_0, p_0 \rangle} p_0 + \frac{\langle p_3, p_1 \rangle}{\langle p_1, p_1 \rangle} p_1 + \frac{\langle p_3, p_2 \rangle}{\langle p_2, p_2 \rangle} p_2
\]

6.7.16. This is very cute! Calculate  \( \|u - v\|^2 \) in terms of dot products, and show that the result is 2. Make sure to justify every step! Also, what property allows you to conclude that the answer is  \( \sqrt{2} \), and not  \(-\sqrt{2}\)?

**SECTION 7.1: DIAGONALIZATION OF SYMMETRIC MATRICES**

7.1.9. Remember orthogonal matrices have orthnormal columns!

7.1.17. First diagonalize the matrix as usual, and then apply Gram-Schmidt to each eigenspace!
7.1.25.

(a) T (by theorem 2; this is the most important fact about symmetric matrices!)
(b) T (by theorem 1)
(c) F (take the identity matrix for example)
(d) F (v has to be a unit vector)