Review for TEST 4

Matrix Analysis MTH 3331

1. Find the length of the vector $(0, -2, 2, 2)$.

   Answer: $2\sqrt{3}$.

2. Find a unit vector in the direction opposite to that of $(-3, 0, -4)$.

   Answer: $(-\frac{3}{5}, 0, \frac{4}{5})$.

3. Find $(3\vec{u}) \cdot \vec{v}$ if $\vec{u} = (1, 2, 3)$ and $\vec{v} = (1, 0, 1)$

   Answer: 12.

4. Find the angle between the vectors $(0, 1, 0, 1)$ and $(3, 3, 3, 3)$.

   Answer: $\dfrac{\pi}{4}$.

5. Find the distance between the vectors $\vec{u} = (3, -2, 2)$ and $\vec{v} = (-3, 5, 0)$.

   Answer: $\sqrt{89}$.

6. Find $\text{proj}_{\vec{v}}\vec{u}$ if $\vec{u} = (1, 2) \quad \text{and} \quad \vec{v} = (2, 1)$.

   Answer: $\left(\frac{8}{5}, \frac{4}{5}\right)$.

7. Use the inner product

$$\langle p, q\rangle = a_0b_0 + a_1b_1 + a_2b_2$$

to find $\langle p, q\rangle$, $\|p\|$, $\|q\|$, and $d(p, q)$ for the polynomials in P_2, where

$$p(x) = 1 - x + 3x^2, \qquad q(x) = x - x^2.$$

Answer: -4, $\sqrt{11}$, $\sqrt{2}$, $\sqrt{21}$.

8. Determine whether the set of vectors S in R^3 is orthogonal, orthonormal, or neither.

$$S = \{(4, -1, 1), (-1, 0, 4), (-4, -17, -1)\}.$$

Answer: Orthogonal.

9. Look at problems 13–17, Section 5.3, page 310.

10. Use the Gram-Shmidt orthonormalization process to transform the basis $\{(1, -2, 2), (2, 2, 1), (2, -1, -2)\}$ into an orthonormal basis.

    Answer: $\{(1/3, -2/3, 2/3), (2/3, 2/3, 1/3), (2/3, -1/3, -2/3)\}$.