Jaypee Institute of Information and Technology
Department of Mathematics

Course: Matrix Computations (16B1NMA533)

Tutorial Sheet 6 [C301-3.3]

(Topics covered: spanning set, dimension, basis, inner product space, norm, parallelogram law)

2. dim=2; basis={(1, -1, 0), (1, 0, 1)}
3. dim=2; basis={(1, 0, 0, 0), (2, 1, 0, 0)}, Some other basis may also exists.
6. $\gamma = \left(-\frac{7}{3}, \frac{2}{3}\right)$.
7. We can prove that no such inner product exists associated with the given norm by contradiction. Take x=(1,0) and y=(0,1) and compute parallelogram law. Parallelogram law must hold for an inner product space.
8. $\|v\| = \sqrt{17}$.

Tutorial Sheet 7 [C301-3.3]

1. $\langle u,\ v\rangle = 6.\ \langle u+v,\ 2u-v\rangle = -4.$
2. $\theta = \cos^{-1}\left(\frac{4\sqrt{6}}{\pi^2}\right)$.
3. $u = \left(\frac{7}{10}, \frac{21}{10}\right),\ v = \left(\frac{3}{10}, -\frac{1}{10}\right)$.
4. (i) $\theta = 19.5^0$; $\begin{bmatrix}8/9\\8/9\\4/9\end{bmatrix}$; $\begin{bmatrix}1/9\\1/9\\-4/9\end{bmatrix}$ (ii) $\theta = 17.7^0$; $\begin{bmatrix}1.2963\\3.2407\\3.2407\end{bmatrix}$; $\begin{bmatrix}-1.2963\\-0.2407\\0.7593\end{bmatrix}$
5. (i) $e_1 = \left(0 \quad \frac{1}{\sqrt{3}} \quad \frac{1}{\sqrt{3}} \quad \frac{1}{\sqrt{3}}\right),\ e_2 = \left(\sqrt{\frac{3}{5}} \quad \frac{1}{\sqrt{15}} \quad \frac{1}{\sqrt{15}} \quad -\frac{2}{\sqrt{15}}\right)$

   (ii) $e_1 = \left(\frac{1}{\sqrt{2}} \quad \frac{1}{\sqrt{2}} \quad 0 \quad 0\right),\ e_2 = \left(-\frac{1}{\sqrt{6}} \quad \frac{1}{\sqrt{6}} \quad -\sqrt{\frac{2}{3}} \quad 0\right),\ e_3 = \left(\frac{1}{2\sqrt{3}} \quad -\frac{1}{2\sqrt{3}} \quad -\frac{1}{2\sqrt{3}} \quad \frac{\sqrt{3}}{2}\right)$
6. (i) Q= $\begin{bmatrix} 0.707 & -0.707 \\ 0.707 & 0.707 \end{bmatrix}$ R= $\begin{bmatrix} 1.41 & 5.66 \\ 0 & 1.41 \end{bmatrix}$

   (ii) Q= $\begin{bmatrix} 0.707 & 0.577 & -0.408 \\ 0.707 & -0.577 & 0.408 \\ 0 & 0.577 & 0.816 \end{bmatrix}$ R= $\begin{bmatrix} 1.41 & 1.41 & 2.83 \\ 0 & 1.73 & 0.577 \\ 0 & 0 & 0.816 \end{bmatrix}$

(iii) $Q=\begin{bmatrix} 0.707 & -0.408 & 0.577 \\ 0.707 & 0.408 & -0.577 \\ 0 & -0.816 & -0.577 \\ 0 & 0 & 0 \end{bmatrix}$ $R=\begin{bmatrix} 1.41 & 0.707 & 0.707 \\ 0 & 1.22 & 0.408 \\ 0 & 0 & 1.15 \end{bmatrix}$