University of Technology Sydney
School of Mathematical and Physical Sciences

37233 Linear Algebra

Exercises 10

Question 1

Given the following matrix:

$$\mathbf{A} = \begin{bmatrix} 3 & 0 & 1 \\ 0 & 2 & 0 \end{bmatrix}$$

(a) Find a singular value decomposition of $\mathbf{A}$

(b) Rewrite the result in the form of a spectral decomposition

Question 2

Consider the following quadratic form on $\mathbb{R}^3$, and write down its matrix:

$$Q(\mathbf{x}) = 6x_1^2 - 8x_1x_2 + 3\big(x_1^2 + x_2^2 + x_3^2\big)$$

(a) Find the principal axes of this quadratic form

(b) Write the change of variables transformation from $\mathbf{x}$ to $\mathbf{y}$ that brings $Q(x)$ to $Q(y)$ with a diagonal matrix

(c) Specify the diagonal matrix of $Q(y)$