CSC352 HW5

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Feb 2023

Question 1

(a)

Since $\mathbf{x} \in \mathbb{R}^m$, let $\mathbf{q_1} = \frac{\mathbf{x_1}}{\|\mathbf{x_1}\|_2}$. Because $\mathbf{x}$ is a vector, it only has one column, the matrix $\mathbf{Q}$ is just $\mathbf{q_1}$. For $\mathbf{R}$, since there is only one columne, $\mathbf{R} = \mathbf{r}_{11} = \|\mathbf{x_1}\|_2$. The QR decomposition will be

$$\mathbf{x} = \frac{\mathbf{x_1}}{\|\mathbf{x_1}\|_2} \cdot \|\mathbf{x_1}\|_2$$

(b)

orthgonal. If it is orthgonal, Q is normalizing each (general proof needed). and the R is having the norm on main diagonal.

(c)

upper traingular. This will make Q to be a identity matrix and R is just the original matrix (proof needed).

Question 2