EE2802: Assignment2

Nikam Pratik Balasaheb

1 Problem

Find the position vector of a point R which divides the line joining two points P = $\begin{pmatrix} 1 \\ 2 \\ -1 \end{pmatrix}$ and Q = $\begin{pmatrix} -1 \\ 1 \\ 1 \end{pmatrix}$ in the ratio 2:1

1) internally
2) externally

2 Solution

$$\mathbf{P} = \begin{pmatrix} 1 \\ 2 \\ -1 \end{pmatrix} \quad \mathbf{Q} = \begin{pmatrix} -1 \\ 1 \\ 1 \end{pmatrix}$$

1) When R divides line segment joining P and Q internally,

$$\mathbf{P} - \mathbf{R} = -2\left(\mathbf{Q} - \mathbf{R}\right) \tag{2.0.1}$$
$$\mathbf{P} - \mathbf{R} = -2\mathbf{Q} + 2\mathbf{R} \tag{2.0.2}$$
$$\mathbf{R} = \frac{2\mathbf{P} + 1\mathbf{Q}}{3} \tag{2.0.3}$$
$$= \frac{2}{3}\mathbf{P} + \frac{1}{3}\mathbf{Q} \tag{2.0.4}$$
$$= \frac{2}{3}\begin{pmatrix} 1 \\ 2 \\ -1 \end{pmatrix} + \frac{1}{3}\begin{pmatrix} -1 \\ 1 \\ 1 \end{pmatrix} \tag{2.0.5}$$
$$\mathbf{R} = \begin{pmatrix} \frac{1}{3} \\ \frac{5}{3} \\ \frac{-1}{3} \end{pmatrix} \tag{2.0.6}$$

2) When R divides line segment joining P and Q externally,

$$\mathbf{P} - \mathbf{R} = 2\left(\mathbf{Q} - \mathbf{R}\right) \tag{2.0.7}$$
$$\mathbf{P} - \mathbf{R} = 2\mathbf{Q} - 2\mathbf{R} \tag{2.0.8}$$
$$\mathbf{R} = 2\mathbf{Q} - \mathbf{P} \tag{2.0.9}$$
$$= 2\begin{pmatrix} -1 \\ 1 \\ 1 \end{pmatrix} - \begin{pmatrix} 1 \\ 2 \\ -1 \end{pmatrix} \tag{2.0.10}$$
$$\mathbf{R} = \begin{pmatrix} -3 \\ 0 \\ 3 \end{pmatrix} \tag{2.0.11}$$