EE5609: Matrix Theory
Assignment-3

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***Abstract*—This document contains a problem based on properties of triangle.**

Download the python codes from

https://github.com/sahilsin/MatrixTheory/tree/master/Assignment3_1/codes

and latex-tikz codes from

https://github.com/sahilsin/MatrixTheory/tree/master/Assignment3_1/figs

1 PROBLEM

In triangle PQR , $PR > PQ$ and PS bisects $\angle QPR$.Prove that $\angle PSR > \angle PSQ$.

2 SOLUTION

Given: $PR > PQ$ and $\angle QPS = \angle RPS$
To Prove: $\angle PSR = \angle PSQ$
Proof:

As PS bisects $\angle QPR$

$$\angle QPS = \angle RPS \tag{2.0.1}$$

$$\cos\angle PQR = \frac{(\mathbf{P}-\mathbf{Q})^T(\mathbf{R}-\mathbf{Q})}{\|\mathbf{P}-\mathbf{Q}\|\,\|\mathbf{R}-\mathbf{Q}\|} \tag{2.0.2}$$

$$\cos\angle PRQ = \frac{(\mathbf{P}-\mathbf{R})^T(\mathbf{Q}-\mathbf{R})}{\|\mathbf{P}-\mathbf{R}\|\,\|\mathbf{Q}-\mathbf{R}\|} \tag{2.0.3}$$

As,

$$\|\mathbf{P}-\mathbf{R}\| > \|\mathbf{P}-\mathbf{Q}\| \tag{2.0.4}$$

So,

$$\cos\angle PQR > \cos\angle PRQ \tag{2.0.5}$$
$$\implies \angle PQR > \angle PRQ \tag{2.0.6}$$

Using property of sum of exterior angle is equal to sum of opposite interior angles.

$$\angle PSR = \angle PQR + \angle QPS \tag{2.0.7}$$
$$\angle PSQ = \angle RPS + \angle PRQ \tag{2.0.8}$$

Adding 2.0.1 and 2.0.6 and using above properties we get :

$$\angle PQR + \angle QPS > \angle PRQ + \angle RPS \tag{2.0.9}$$
$$\angle PSR > \angle PSQ \tag{2.0.10}$$

Hence proved!

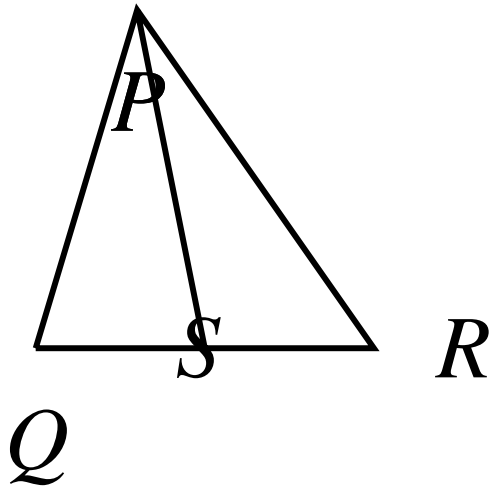

Fig. 0: Right Angled Triangle