# MATH 505B Homework 4

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April 16, 2016

## Problem 6.14.1

$$
\begin{aligned}
\langle \mathbf{x}, \mathbf{Py} \rangle &= \sum_{k \in \theta} x_k (\mathbf{Py})_k \pi_k \\
&= \sum_{k \in \theta} x_k (\sum_j p_{kj} y_j) \pi_k \\
&= \sum_{k \in \theta} x_k (\sum_j p_{kj} \pi_k y_j) \\
&= \sum_{k,j} x_k p_{kj} \pi_k y_j \\
&= \sum_{k,j} x_k (p_{jk} \pi_j y_j) \text{ using reversibility criterion } \pi_j p_{jk} = \pi_k p_{kj} \\
&= \sum_j p_{jk} x_k \pi_j y_j \\
&= \sum_{j \in \theta} (\sum_k p_{jk} x_k) \pi_j y_j \\
&= \langle \mathbf{Px}, \mathbf{y} \rangle
\end{aligned}
$$

## Problem 6.14.2