Assignment 4
Due date : November 21, 2013

Total points = 10
No penalties for late submission. But I won't accept assignments after end sem exam on Nov 28

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1. Prove that the cross ratio (of 4 collinear points) is invariant under projective transformation.

2. Why does a linear transformation $T : \mathbb{R}^3 \to \mathbb{R}^3$ have at least one real eigenvalue? Using this fact, prove that a projective transformation has at least one fixed point.

3. Find a fixed point for the projective transformation given by the matrix

$$M = \begin{pmatrix} 1 & 2 & 3 \\ 0 & 2 & 3 \\ 0 & 0 & 3 \end{pmatrix}$$

4. Find the projective transformation (upto a scalar multiple) which takes the unit circle

$$\left\{ (x : y : 1) \in \mathbb{RP}^2 \;\middle|\; x^2 + y^2 = 1 \right\}$$

to the parabola

$$\left\{ (x : y : 1) \in \mathbb{RP}^2 \;\middle|\; y^2 = 4x \right\}.$$