**ME 55600/I0200**

**HW #1 Governing Equations**

The velocity vector for an axisymmetric flow in spherical coordinates is defined by,

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and the continuity equation is:

1. Show that the continuity equation is satisfied by using the following definition of a stream function :
2. For low Reynolds numbers it can be shown that the axisymmetric Navier Stokes equations are reduced to

where,

Show that the equation can be represented by

where the operator is

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1. Substitute the velocity components into the continuity equation:
2. For low Reynolds numbers it can be shown that the axisymmetric Navier Stokes equations are reduced to

where

Therefore:

Note that the last determinant is of the same form as first one with replacing Hence,