Assignment #1 part I, Fluid Mechanics 2011

due on Sept. 29, 2011

1: Prove that the following equations are true by using index notation

$$(\vec{a} \times \vec{b}\,) \cdot \vec{c} = \vec{a} \cdot (\vec{b} \times \vec{c}\,) = (\vec{c} \times \vec{a}\,) \cdot \vec{b}$$

$$\vec{u} \times \vec{v} = -\vec{v} \times \vec{u}$$

2: Write the following formulas in index notation and prove that the equations are correct

$$\mathrm{div}\,(\phi\vec{v}\,) = \phi \mathrm{div}\,\vec{v} + \vec{v} \cdot \mathrm{grad}\,\phi$$

$$\mathrm{div}(\vec{u} \times \vec{v}\,) = \vec{v} \cdot \mathrm{curl}\,\vec{u} - \vec{u} \cdot \mathrm{curl}\,\vec{v}$$