Petroleum Seismology, spring 2012 Homework #1 Due Jan 30, 2012 typed and on <u>paper</u> by the <u>start</u> of class (NO EXCEPTIONS)

Purpose: Review Vector Algebra

Q. 1 For three given vectors, **a**,**b**,**c**, show if the following identities hold true:

$$a \times (b \times c) = (a \cdot c)b \cdot (a \cdot b)c$$

$$(a \times b) \cdot (c \times d) = (a \cdot c)(b \cdot d) \cdot (b \cdot c)(a \cdot d)$$

$$(a \times b) \times (c \times d) = (a \cdot b \times d)c \cdot (a \cdot b \times c)d$$

Q. 2 Show that the coordinate transformation from a Galperin geophone arrangement (u, v, w) into a cardinal arrangement (n, e, z) is equivalent to the following: (Include a diagram to illustrate the rotation.)

$$\begin{pmatrix} n \\ e \\ z \end{pmatrix} = \frac{1}{\sqrt{6}} \begin{pmatrix} -2 & 1 & 1 \\ 0 & \sqrt{3} & -\sqrt{3} \\ \sqrt{2} & \sqrt{2} & \sqrt{2} \end{pmatrix} \begin{pmatrix} u \\ v \\ w \end{pmatrix}$$