Fluid Mechanics Homework #1

——杨敬轩

——SZ160310217

1.1 Starting from (2.1) and (2.3), prove (2.7).

证明：已知





求证



令方向余弦矩阵，由式可知



由式可知



则由式和式可得



证毕.

1.2 Using Cartesian coordinates where the position vector is and the fluid velocity is , write out the three components of the vector:



解：



1.3 Prove the following relationship:.

证明：



证毕.

1.4 Show that , where  is the direction cosine matrix and *δ* is the matrix of the Kronecker delta. Any matrix obeying such a relationship is called an orthogonal matrix because it represents transformation of one set of orthogonal axes into another.

证明：Kronecker delta写成矩阵形式为单位矩阵



由式可知



由式可知



则由式和式可得



将式和式分别写成矩阵形式





由式和式可知的转置矩阵与逆矩阵相等，



那么



即



证毕.