# CMT107 : Visual Computing - **Exercise Sheet 3**

Reflection and Refraction

4) Let **r** be the direction vector of the perfect reflection of a light ray at a point **p** on a surface with normal **n**. Give the equations to compute the direction vector **d** of the original light ray. See figure below. Assume **d**, **r**, and **n** are all unit vectors.
(Hints: Perfect reflection means the angle between **n** and **d** is equal to the angle between **n** and **r**, so the projection of **d** on the surface is the same as the projection of **r** on the surface, and the projection of **d** on **n** direction is the negative vector of the projection **r** on **n**).
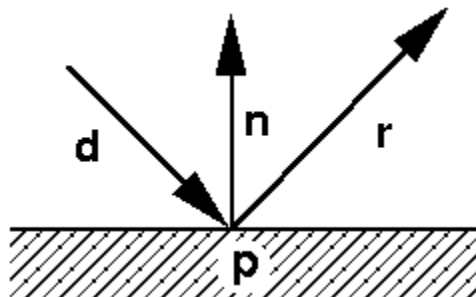
5) A light vector **v** passing from air into water is refracted on the water surface (see figure). Given **v**, and the unit normal **n** of the water surface, compute the resulting vector **w**. Assume that the projections of **v** and **w** onto **n** have the same length and that the projection of **w** onto the water surface has half the length of the projection of **v** onto the surface.