Worksheet, Sep 6

(1) Show that the curve

$$\vec{r}(t) = \langle 1 + t^2, 1 + t^2, 1 + t \rangle$$

does not intersect the plane P

$$-2x + 3y + z = 1.$$

(2) Compute the function $d(t)$ describes the distance between the plane P and the point $\vec{r}(t)$.

(3) Using single variable calculus, find the time t_0 which minimizes the function $d(t)$. Use this to find the point on the curve parameterized by $\vec{r}(t)$ which is closest to the plane.

(4) Compute $\vec{n}$, the normal vector to the plane. Compute the velocity vector $\vec{v}(t) = \frac{d\vec{r}}{dt}$.

(5) Geometrically explain why

$$\vec{n} \cdot \vec{v}(t_0) = 0$$

and verify this identity.