1. An object is moving so that its position at time t is given by the vector function

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

Find the tangent component and the normal component of the acceleration $\vec{\alpha}$ at $t = 2$. Then decompose $\vec{\alpha}(1)$ as

$$\vec{\alpha}(1) = \alpha_T \vec{T} + \alpha_N \vec{N}.$$

(Some fractions may appear.)

2. Reparametrize the curve

$$\vec{r}(t) = < \frac{2}{t^2+1} - 1, \frac{2t}{t^2+1}, 1 >$$

with respect to arc length measured from point $(1, 0, 1)$ in the direction of increasing t. Express the reparametrization in its simplest form.