1) Find T, N and κ for plane curves

i) $\vec{r}(t) = t\hat{i} + (\ln \cos t)\hat{j}$, $-\pi/2 < t < \pi/2$

ii) $\vec{r}(t) = (2t+3)\hat{i} + (5-t^2)\hat{j}$, $-\pi/2 < t < \pi/2$

iii) $\vec{r}(t) = (\cos t + t \sin t)\hat{i} + (\sin t - t\cos t)\hat{j}$, $t > 0$.

2) Find T, N and κ for the space curves

i) $\vec{r}(t) = (3\sin t)\hat{i} + (3\cos t)\hat{j} + 4t\hat{k}$

ii) $\vec{r}(t) = (e^t \cos t)\hat{i} + (e^t \sin t)\hat{j} + 2\hat{k}$

3) Find the length of the curve

$$\vec{r}(t) = (\sqrt{2}t)\hat{i} + (\sqrt{2}t)\hat{j} + (1-t^2)\hat{k}$$

from $(0,0,1)$ to $(\sqrt{2}, \sqrt{2}, 0)$.

4) Find an equation for the circle of curvature of the curve $\vec{r}(t) = t\hat{i} + (\sin t)\hat{j}$ at the point $(\pi/2, 1)$.

5) Find the length of the arc of the circular helix with vector eqn'n.

$\vec{r}(t) = \langle \cos t, \sin t, t \rangle$ from $(1,0,0)$ to $(1, 0, 2\pi)$