Calculus III Review Two

1. Find the domain of $\mathbf{r}(t) = \left\langle \dfrac{t^2-4}{t+2}, \sin(t), \ln(9-t^2) \right\rangle$, and compute $\lim\limits_{t\to -2} \mathbf{r}(t)$.
2. Find the tangent line to the curve $\mathbf{r}(t) = \langle e^t, te^t, te^{t^2} \rangle$ at $(1,0,0)$.
3. Find the length of the curve $\mathbf{r}(t) = \langle 2t, t^2, \frac{1}{3}t^3 \rangle$, $0 \leq t \leq 1$.
4. Given the curve $\mathbf{r}(t) = \langle \cos(t), \sin(t), \ln(\cos(t)) \rangle$, find the vectors **T**, **N**, and **B** and the curvature at the point $(1,0,0)$.
5. Consider a particle with acceleration $\mathbf{a}(t) = \langle t, e^t, e^{-t} \rangle$, initial velocity $\mathbf{v}_0 = \langle 0,0,1 \rangle$, and initial position $\mathbf{r}_0 = \langle 0,1,1 \rangle$. Find the position function for this particle.