1. Determine parametric equations for the tangent line to the curve described by \( \mathbf{r}(t) = (2 - t^2) \mathbf{i} - (1 - t^2) \mathbf{j} + 5t \mathbf{k} \) at \( P = (1, 0, -5) \). At what point does the tangent line intersect the plane \( x + 2y + 3z = 12 \)?

2. Calculate the arc length of the curve parameterized by \( \mathbf{r}(t) = (1 + t)^{3/2} \mathbf{i} + (1 - t)^{3/2} \mathbf{j} + t^{3/2} \mathbf{k}, \quad 0 \leq t \leq 1 \).

3. Calculate the radius of curvature and the center of curvature of the curve \( \mathbf{r}(t) = \sqrt{t} \mathbf{i} + (2 - t) \mathbf{j} + 3t \mathbf{k} \) at the point \((2, -2, 12)\).

4. Find the Cartesian equation of the osculating plane of the curve \( \mathbf{r}(t) = (2 - t^2) \mathbf{i} + 2t^3 \mathbf{j} + t^2 \mathbf{k} \) at the point \((1, 2, 1)\).

5. Calculate \( \mathbf{v}(t), \mathbf{a}(t), \kappa_{T}(t), \mathbf{T}(t), \mathbf{N}(t) \), and the tangential and normal components, \( a_T \) and \( a_N \), of acceleration for the spatial motion \( \mathbf{r}(t) = (t - t^2) \mathbf{i} + (t + t^2) \mathbf{j} + t^2 \mathbf{k} \).