NAME ______________________________

[1] For each statement below, circle T if the statement is true and circle F if the statement is false. Include a full justification of your answer (if the statement is false, a counter example will suffice for an explanation).

(a) T  or  F  Let \( r(t) \) be a curve. A normal vector to the normal plane at time \( t \) is the unit normal \( N(t) \).

(b) T  or  F  The curvature of a line is zero at every point.

(c) T  or  F  \( N \times B = T \).

[2] Let \( r(u) = \left( \frac{1}{2} u^2, 2\sqrt{2} u^{\frac{3}{2}}, u \right) \), for \( 0 \leq u \leq 27 \). Calculate the arclength function \( s(t) \).
At what point(s) on the curve \( \mathbf{r}(t) = \left( \frac{1}{3}t^3, 3t, t \right) \) is the normal plane parallel to the plane \( 2x + 6y + 2z = 3 \)?