1. Find an equation for the circle of curvature of the curve \( r(t) = ti + (\sin(t))j \) at the point \( \left( \frac{\pi}{2}, 1 \right) \). (The curve parameterizes the graph of \( y = \sin x \) in the xy-plane.)

2. Write \( a \) in the form \( a = a_T T + a_N N \) without finding \( T \) and \( N \) given the curve \( r(t) = (\cos(t))i + (\sin(t))j + btk \)

3. In the following curves write \( a \) in the same form as problem 2 at the given value of \( t \) without finding \( T \) and \( N \).
   a. \( r(t) = (t + 1)i + 2tj + t^2k, \ t = 1 \)
   b. \( r(t) = t^2i + \left( t + \left( \frac{1}{3} t^3 \right) \right)j + \left( t - \left( \frac{1}{3} t^3 \right) \right)k, \ t = 0 \)

4. Find \( a_T \) and \( a_N \) for the curve \( r(t) = (t + t^2, t - t^2, 2t) \)