

Let  $r(t) = ti + t^2j + t^3k = (t, t^2, t^3)$  be a space curve.

- (a) Find  $a_T$ , the tangential component of acceleration, at time  $t = 1$ .
- (b) Find  $\kappa$ , the curvature of the curve traced out by  $r(t)$ , at position  $(1, 1, 1)$  on the curve (which occurs at time  $t = 1$ ).
- (c) Find  $a_N$ , the normal component of acceleration, at time  $t = 1$ . (The information in part (b) may be useful in this calculation.)