q4 Rahul Paleja section 22

① Find a parametric equation for the tangent line to the curve with the given parametric equation at the specified point

$x = \cos t,\ y = \sin t,\ z = t^2 + 1 ;\ (1, 0, 1)$

$1 = \cos t \qquad 0 = \sin t \qquad 1 = t^2 + 1$

$0 = t \qquad 0 = t \qquad 0 = t$

$r(t) = \langle \cos t, \sin t, t^2 + 1 \rangle$

$r'(t) = \langle -\sin t, \cos t, 2t \rangle$

$r'(0) = \langle 0, 1, 0 \rangle$

Equation of Tangent line in vector form:

$\langle 1, 0, 1 \rangle + t\langle 0, 1, 0 \rangle = \langle 1, t, 1 \rangle$

$x = 1 \quad y = t \quad z = 1$

② $r(t) = \int (ti + 2j + (t+1)k)\, dt$

distribute

$= \int (ti + 2j + tk + 1k)\, dt$

$= \frac{t^2}{2} i + 2tj + \frac{t^2}{2} k + tk + C$

$= \frac{t^2}{2} i + 2tj + \left(\frac{t^2}{2} + t\right) k + C$

$r(0) = 0 + 0 + 0 + C = i + 2j + 3k$

$r(t) = \frac{t^2}{2} i + 2tj + \left(\frac{t^2}{2} + t\right) k + i + 2j + 3k$

$r(t) = \left(\frac{t^2}{2} + 1\right) i + (2t + 2) j + \left(\frac{t^2}{2} + t + 3\right) k$