208. Find T, N, B, κ at he given point of the given curve:

   a) $r(t) = e^t \cos ti + e^t \sin tj + e^t k, A\,(\,1, 0, 1\,)$
   b) $r(t) = (1 + t)i + (3 - t)j + (2t + 4)k, B(4, 0, 10)$
   c) $r(t) = 2Ch\frac{t}{2}i + 2Sh\frac{t}{2}j + 2tk, C(2, 0, 0)$

209. Find the equation of the FRENET planes of the curve
$\vec{r} = \sin 3ti + \cos 3tj + 2t^{\frac{3}{2}}k$ at $(0, 1, 0)$

210. Consider the space curve

$$r : x = \frac{(t-a)^3(t-b)}{t}, y = \frac{(t-a)(t-b)^3}{t}, z = t^3$$

show that if the osculating plane at a point P passes through Q on r, the osculating plane at Q passes through P.

211. Prove that
   a) $(T', T'', T''') = \kappa^3(\kappa\tau' - \kappa'\tau) = \kappa^5 \frac{d}{ds}(\frac{\tau}{\kappa})$
   b) $(B', B'', B''') = \tau^3(\kappa'\tau - \kappa\tau') = \tau^5 \frac{d}{ds}(\frac{\kappa}{\tau})$

212. Prove that
$B = \dot{r}x\ddot{r}/K\dot{s}^3$, $N = (\dot{s}\ddot{r} - \ddot{s}\dot{r})/\kappa\dot{s}^2$, $\kappa^2 = (\ddot{r}^2 - \dot{s}^2)/\dot{s}^4$. and
$\tau = (\dot{r}\ddot{r}\dddot{r})/\kappa^2\dot{s}^6$

213. Prove
   a) $r' \cdot r'' = 0$, $r'r''' = -\kappa^2$, $r' \cdot r''' = -3\kappa\kappa'$
   b) $r''' \cdot r''' = \kappa'\kappa'' + 2\kappa^3\kappa' + \kappa^2\tau\tau' + \kappa\kappa'\tau^2$
   c) $T' \cdot B' = -K\tau$

214. Squaring $r''' = -\kappa^2\tau + \kappa' N + K\tau B$ obtain
   a) $\tau^3 = \frac{1}{\kappa^2}r'''^2 - \kappa^2 - (\frac{\kappa'}{\kappa})^2$
   b) $r''' = -3\kappa\kappa' T + (\kappa'' - \kappa^3 - KT^2)N + (2K'T + KT')B$

215. Given $r^{(n)} = a_n T + b_n N + c_n B$ show that