$+(-\cos 2t, -\frac{1}{2}\sin 2t, 0) \times \left(\frac{1}{2}\frac{d}{dt}(-\cos 2t, -\frac{1}{2}\sin 2t, 0)\right)$

$= (\cos 2t, \frac{1}{2}\sin 2t, 0) \times (-\sin 2t, \frac{1}{2}\cos 2t, 0)$
$+ (-\cos 2t, -\frac{1}{2}\sin 2t, 0) \times (\sin 2t, -\frac{1}{2}\cos 2t, 0)$
$= (0-0, 0-0, \frac{1}{2}\cos^2 2t - \frac{1}{2}\sin 2t \times -\sin 2t)$
$+ (0-0, 0-0, \frac{1}{2}\cos^2 2t - -\frac{1}{2}\sin 2t(\times \sin 2t)$
$= (0, 0, \frac{1}{2}) + (0, 0, \frac{1}{2}) = (0, 0, 1)$ 6

vii) $\vec{x}_A = \cos 2t\, i + \frac{1}{2}\sin 2t\, j$ $\qquad \vec{x}_B = -\cos 2t\, i - \frac{1}{2}\sin 2t\, j$

$\frac{dx_A}{dt} = -2\sin 2t\, i + \cos 2t\, j$ $\qquad \frac{dx_B}{dt} = 2\sin 2t\, i - \cos 2t\, j$ 2

$\frac{d^2x_A}{dt} = -4\cos 2t\, i - 2\sin 2t\, j$ $\qquad \frac{d^2x_B}{dt^2} = 4\cos 2t\, i + 2\sin 2t\, j$

$F_A = m_A \frac{d^2x_A}{dt^2}$ $\qquad F_B = m_B \frac{d^2x_B}{dt^2}$

$= \frac{1}{2}(-4\cos 2t\, i - 2\sin 2t\, j)$ $\qquad = \frac{1}{2}(4\cos 2t\, i + 2\sin 2t\, j)$

$= -2\cos 2t\, i - \sin 2t\, j$ $\qquad = 2\cos 2t\, i + \sin 2t\, j$ 2.

$(\overrightarrow{x_A - x_B})$ = displacement vector from 4
$= \cos 2t\, i + \frac{1}{2}\sin 2t\, j - (-\cos 2t\, i - \frac{1}{2}\sin 2t\, j)$
$= 2\cos 2t\, i + \sin 2t\, j$

$\frac{\vec{F}_A}{\vec{x_A - x_B}} = \frac{-2\cos 2t\, i - \sin 2t\, j}{2\cos 2t\, i + \sin 2t\, j} = -1$

$\frac{\vec{F}_B}{x_A - x_B} = \frac{2\cos 2t\, i + \sin 2t\, j}{2\cos 2t\, i + \sin 2t\, j} = 1$

Hence force on each of A and B is proportional to $(x_A - x_B)$

The forces F_A and F_B are not scalar multiples of $\frac{d^2x'_A(t)}{dt^2}$ and $\frac{d^2x'_B}{dt^2}$ in S'. Also S' is not an inertial frame of reference, from iii) hence fictitious forces appear to act

3

4