1 . Prove that $A \cdot B = A_1 B_1 + A_2 B_2 + A_3 B_3$,

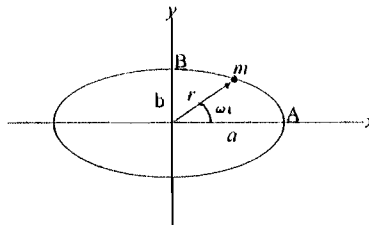　　If $A = A_1 i + A_2 j + A_3 k$ and $B = B_1 i + B_2 j + B_3 k$

2 . If $r = (t^3 + 2t) i - 3e^{-2t} j + 2\sin 5t\, k$

　　Find (a) $dr/dt$, (b) $| dr/dt |$ , (c) $d^2 r/dt^2$, (d) $| d^2 r/dt^2 |$ .

3 . A particle with mass $m$ moving in xy plane with $r = a\cos\omega t\, i + b\sin\omega t\, j$, where a, b and $\omega$ are constant, and a > b. Please find :

　　(a) the kinetic energy at position A and B.

　　(b) how much work will be needed for the particle move from position A to B.



4 . A projectile is fired at an angle $\alpha$ with initial velocity $v_o$, please find :

　　(a) position r as the function of $t$.

　　(b) time $t$ and height $h$ at maximum altitude,

　　(c) time $t$ and distance $d$ the projectile reach the ground.

5 . A particle moving in the xy plane with force $F = -kx\, i - ky\, j$, show that in what condition the particle will moving along the elliptical, circle or a straight line.

6 . Describe and derive (a) the virtual work theorem and (b) D'Alember theoream.