

Answers without **supporting work** or **necessary unit** will not be given full credit. If the meaning of the question isn't clear, please ask TA! You have **35mins** to complete this mini-test.

Q.1 There is a vertical spring hanging an object with mass m , if we make a vertical oscillation to the system.

(Period: T ; Mass of object: m ; Spring constant: k ; Gravity: g)

(a) Write down the dimension of each parameter T , m , k , g . (4 point)

(b) Use dimensional analysis to solve Eq.(1). (6 point)

Hint: Do not just write down the value of x , y , z , show your process.

$$T \propto m^x \cdot k^y \cdot g^z \quad (1)$$

Q.2 A particle is doing uniform circular motion, which lies on the x-y coordinate plane, moving clockwise (y to x-axis) with a period $T = 4s$. At one instant, $t = t_0$, its velocity $\vec{v} = 3\pi\hat{x} + 4\pi\hat{y} [\frac{m}{s}]$.

(a) At t_0 , what is its position vector \vec{r} ? (5 points)

(b) After $3s$, if the radius of the circle is increased to $2|\vec{r}|$, while the period remains T . What is its centripetal acceleration \vec{a} ? (5 points)

Hint: please use \hat{x} and \hat{y} to express, and don't forget the unit!