

# 淡江大學 104 學年度日間部轉學生招生考試試題

31

系別：物理學系三年級

科目：理論力學

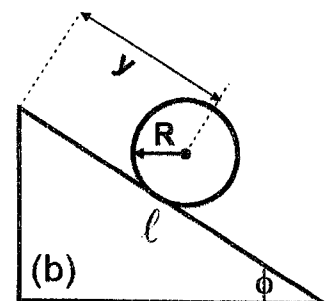
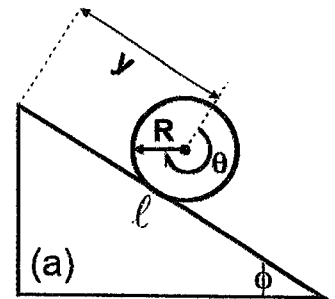
考試日期：7月26日(星期日) 第3節

本試題共 4 大題， 1 頁

1. Consider a ring (with mass  $M$ ) moving down an inclined plane with a length of  $\ell$  (as shown in the figures).

(a) Please find the equation of motion and angular acceleration of the *rolling* ring. [15 分]

(b) Using the Hamiltonian dynamics, find the equation of motion and the acceleration of the center of mass of the *sliding* ring. [15 分]



2. Find the displacement and velocity of a particle (mass  $m$ ) with initial downward velocity  $v_0$  undergoing vertical motion in a constant downward gravitational field

(a) without air resistance. [5 分]

(b) with air resistance which is proportional to the velocity ( $kmv$ ). [10 分]

(c) Please also determine the terminal velocity in the case of (b). [5 分]

3. Consider two identical bowling balls (with the same mass  $M$ ), the 1<sup>st</sup> one moves toward the 2<sup>nd</sup> one which is at rest, as shown in Fig.3. Assuming both are hard spheres, please find the differential and total cross section. [30 分]

[Hint:  $2\pi\sigma(\psi)\sin\psi d\psi = -2\pi b db$ ]

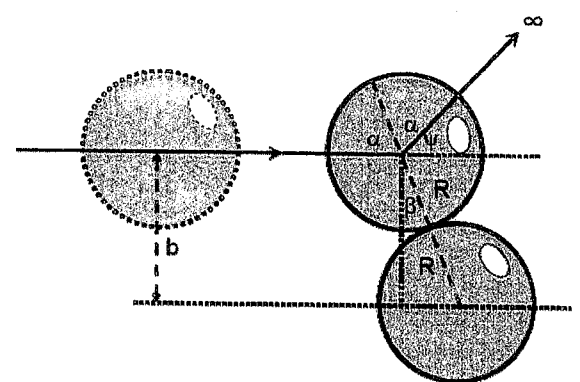


Fig. 3

4. Please find the principle moments and principal axes of a homogeneous square with density  $\rho$  and mass  $M$ . [20 分]

