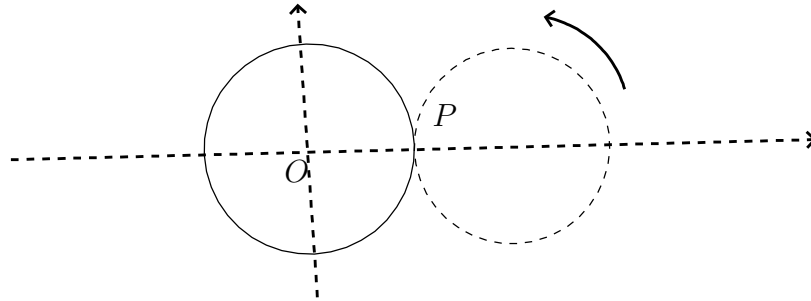


# HOMEWORK 1

(Total 20 pts; Due Sept. 22 12pm)

QUESTION 1. (5 PTS) Let  $u = (3, 0, 4)$ ,  $v = (1, 0, 5)$ ,  $w = (0, 7, 0)$ . Calculate  
 a)  $\|u\|$ ; b)  $u \cdot v$ ; c)  $(u \times v) \cdot w$ ; d)  $u \cdot (v \times w)$ ; e) The angle between  $u, w$ .

QUESTION 2. (5 PTS) Write down a parametrized representation of the trajectory of a fixed point  $P$  on a unit circle rolling outside another unit circle centered at the origin. Then calculate the arc length of the curve. (You may want to recall the formula for  $\cos 2\theta$ )



QUESTION 3. (5 PTS) Let  $\gamma(t) = (5 \cos t, 5 \sin t, 12t)$ . Parametrize it by arc length.

QUESTION 4. (5 PTS) Calculate the surface area of

$$S = \left\{ (x, y, z) \mid x^2 + y^2 + z^2 = 1, -\frac{1}{2} < z < \frac{1}{2} \right\}. \quad (1)$$