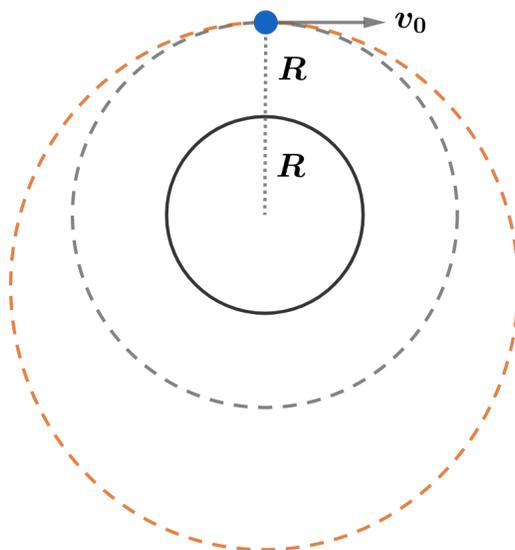


# 2019A F=ma Exam: Problem 8

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For a circular orbit,

$$\frac{GMm}{(2R)^2} = \frac{mv_c^2}{2R}$$
$$v_c = \sqrt{\frac{GM}{2R}}$$

We have

$$v_0 = \sqrt{\frac{2GM}{3R}} > \sqrt{\frac{GM}{2R}} = v_c$$

The escape velocity is given by

$$\frac{1}{2}mv_e^2 = \frac{GMm}{2R}$$
$$v_e = \sqrt{\frac{GM}{R}}$$

We have

$$v_0 = \sqrt{\frac{2GM}{3R}} < \sqrt{\frac{GM}{R}} = v_e$$

Hence, the trajectory is an ellipse with minimum distance  $R$  from the surface so the answer is  C.