

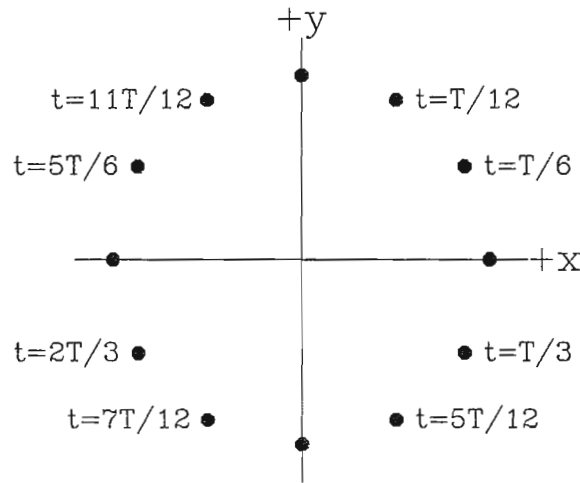
Problem 1. Inside a starship at rest on earth, a ball rolls off the top of a horizontal table and lands a distance D from the foot of the table. The starship now lands on the unexplored Planet X. The commander, Captain Curious, rolls the same ball off the same table with the same initial speed as on earth and finds that it lands a distance $2.76D$ from the foot of the table. What is the acceleration of gravity on the planet?

COMMENTS



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Problem 2. An object travels in uniform circular motion along a path with circumference C , as shown in the figure below, and period T .



a) What is the object's instantaneous vector velocity \vec{v} at time $t = 0$? (In this and all subsequent parts, comment to the right of the dashed line).

⋮

b) What is the object's instantaneous vector velocity \vec{v} at time $t = T/2$?

⋮

c) What is the object's average vector velocity $\langle \vec{v} \rangle$ between $t = 0$ and $t = T/2$?

⋮

d) What is the object's average vector acceleration $\langle \vec{a} \rangle$ between $t = 0$ and $t = T/2$?



e) What is the object's instantaneous acceleration \vec{a} at time $t = 0$?



Now consider a second "primed" coordinate frame x', y' moving with vector velocity $-\frac{C}{T}\hat{i}$ with respect to the frame shown.

f) What is the object's instantaneous vector velocity \vec{v}' , with respect to the primed, x', y' frame at $t = T/2$?



g) What is the object's instantaneous vector acceleration \vec{a}' , with respect to the primed, x', y' frame at $t = T/2$?



Problem 3. A projectile is launched toward the east at angle θ to the ground. At the same instant a rocket sled starting at rest at the same point accelerates along the ground toward the east with constant acceleration. Find the value of that acceleration that causes the projectile to hit the sled when it returns to ground level.

COMMENTS

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