NEWTON'S 2ND LAW +

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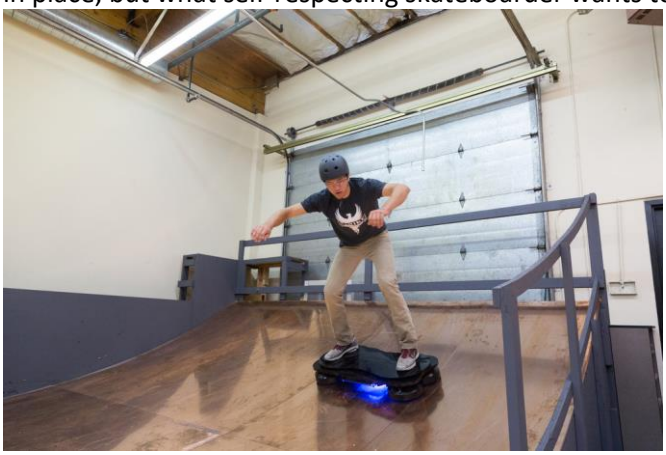
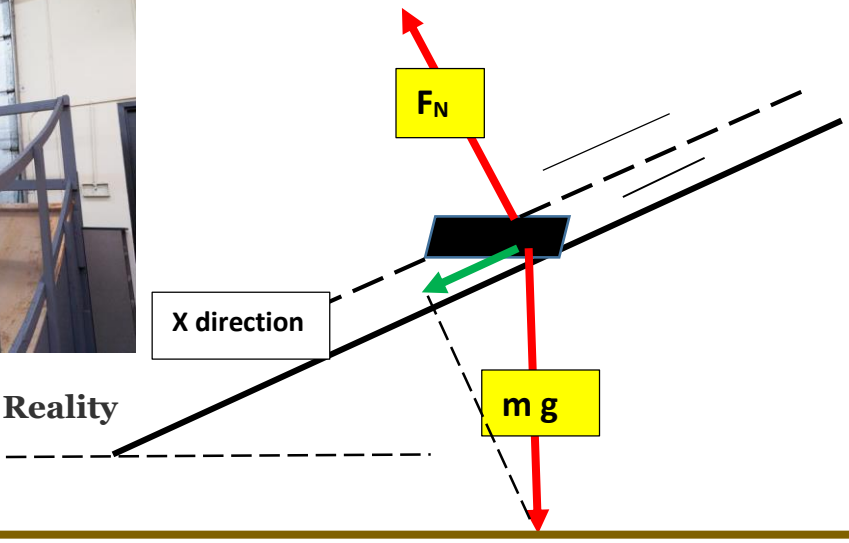
Hoverboard ? Still in the Future

A Real Hoverboard?

Ever since Marty McFly rode a hoverboard in 1989's **"Back to The Future II,"** people have been dreaming of making the floating device a reality. In 2014, a California start-up said it had it figured out. The hoverboard is fiction, the vision of screenwriters who created the film about Marty McFly, a teenager who travels from **1985 to Oct. 21, 2015, and uses a floating skateboard to flee a gang of bullies.** The movie had other futuristic items, like flying cars and self-tying shoes, but none touched the imagination as much as the hoverboard. **For the last 25 years, garage tinkerers, physics professors and top engineers at Google have been trying to make one.** Inside a drab office park here in Northern California, Greg and Jill Henderson are working on the latest effort. On a recent visit the couple allowed **a reporter to stand atop a noisy magnetic skateboard that can float above a copper surface. It hovers about an inch above the ground. (((But when the 190-pound visitor stood atop the 100-pound board, one gentle push was enough to send him spinning across the room over a cushion of air.))) The hoverboard floats on a magnetic field similar to magnetic levitation trains**. This has been extremely difficult, mostly because of something called **Earnshaw's theorem**, which states, more or less, that **repelling magnets are tough to balance.** One way is to use a track that would hold the magnetic skateboard in place, but what self-respecting skateboarder wants to be constrained to a track?



Turning a Floating Fantasy Into Reality



INTRODUCTION: **This magnetic hoverboard experiences no frictional forces. Acceleration happens just due to force of the component of weight down the 30^o hill. From top to bottom this copper surfaced hill is 20 feet long. The hoverboard rider starts from rest at top of the slope.**

QUESTIONS: **(a) Set up Newton's second law: $F_{NET} = m\ a$ in this case? (b) Find acceleration down the slope? (c) Find speed at bottom of hill?, (d) Find time to slide downhill if boarder started from rest at the top?**

HINTS: $F_{NET} = m\ a$, $V^2 = V_o^2 + 2\ a\ X$, $X = V_0\ t + \frac{1}{2}\ a\ t^2$

ANSWERS: **(a) $m\ g \sin. 30^o = m\ a$, (b) 16 ft./s.^{2} , (c) V = 25.3 ft./s. , (d) 1.6 s. = t**