NEWTON'S 2ND LAW

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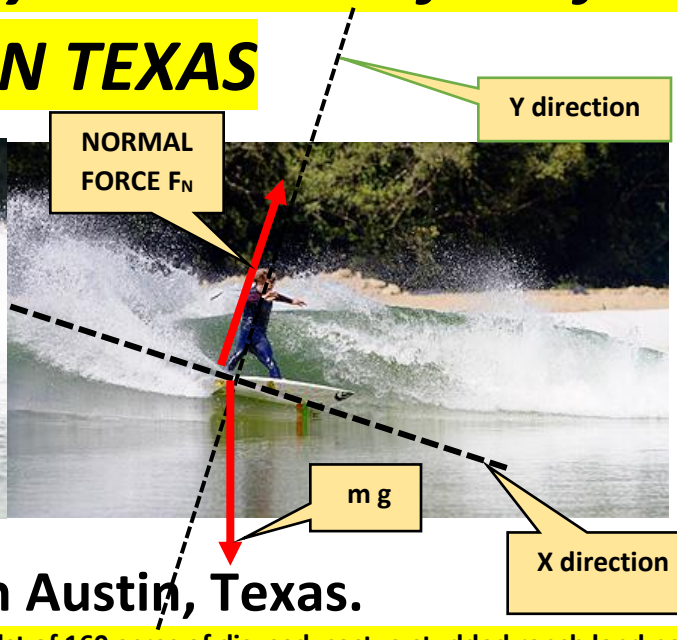
First-Person Surfer: My Test Drive of Artificial Waves: NW OF AUSTIN TEXAS



Taming the Waikiki Wave in Austin, Texas.

NLand Surf Park, with its **Wavegarden lagoon in the midst of 160 acres of disused, cactus-studded ranch land near Austin, Tex.,** is seeking to become a surfer destination. As a surfer whose enthusiasm still far outweighs her talent and skill, I was eager to try an artificial wave. In nature, the creation of surfable waves depends on a near-mystical interplay among winds gusting far out at sea, cycles of the tides and the moon, the shifting contours of the ocean floor and coastline, and the weather and light at the break. I was pretty sure I couldn't handle the **advanced wave** that, with a **five- to six-foot face**, was twice the height I felt comfortable riding. But NLand's surf lagoon is designed with an intermediate wave that forms out of the white water rushing forward once the big one breaks. **The wave itself felt no different from a real ocean wave** — and a fun one at that, with sufficient push to get going and a mellow, clean face that stood up long enough for me to get a very good ride. I came out of the lagoon, crossing the slippery white plastic lip and beige mesh that create a shoreline of sorts, convinced that I could significantly up my game with even a few hours at the park. Knowing precisely where the wave will be — and not having to fight through strong currents or a crowd of other surfers to get there — meant that I could focus on a few skills, such as getting into the right position on the board, turning and following a line of energy in the water.

INTRODUCTION: **Surfing down a wave at constant speed (see graphic above) implies no acceleration exists. Thus, sum of forces in the direction of motion (in graphic above the motion is in positive X direction) must be zero.**

QUESTIONS: **(a) Sketch in graphic above the forces on surfer in positive and negative direction? (b) Write the working equation of forces on surfer (F_{NET})? Essentially, write down the application of newton's 2nd law in this situation? Note: coefficient of friction(μ)between water and surfboard is 0.25. (c) Find the angle of the surfboard to the horizontal?**

HINTS: $F_{NET} = m\,a$, $F_{NORMAL\ FORCE} = m\,g\cos\Theta$, friction force $= f = \mu F_{NORMAL}$, F_X(downhill) $= m\,g\sin\Theta$, $\tan\Theta = \sin\Theta/\cos\Theta$

ANSWERS: **(a) _____, (b) $m\,g\sin\Theta - \mu\,m\,g\cos\Theta = 0$, (c) $\Theta = \sim 14^o$**