

Testing Newtonian Laws of Motion: Blue Streak Roller Coaster



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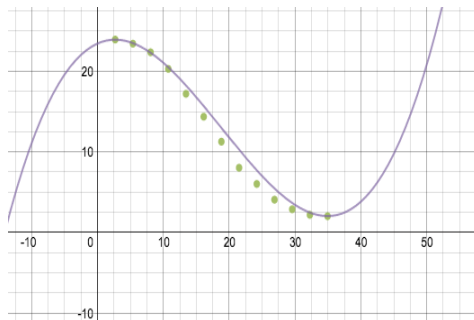


Objectives

- To reach a conclusion of whether or not Newtonian laws can be applied to find out how fast the cars on the Blue Streak roller coaster go at various heights and check points along its track.
- To clearly show the accuracy of our approximations through error analysis.

Definitions

- The mass of the roller coaster is unknown—(m).
- The coefficient of friction is unknown for the equation for friction between the wheels of the trains and track—(u).
- The air resistance coefficient is unknown for the equation—(p).



Methods

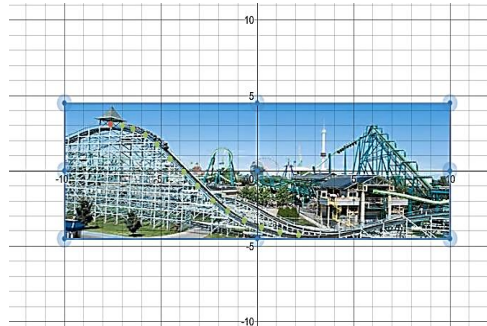
$$2 * g * h = v^2, \text{ \#1}$$

$$(m * g) * u * L = \text{Energy lost, \#2}$$

Note: "L" is the change in distance.

$$0.5 * \rho * v^2 * m * A * L = \text{Energy lost, \#3}$$

Note: "V" is the incident velocity along the rollercoaster's drop, "p" is the density of air, "A" is the area facing the direction of the object's velocity.



To figure out the length of the track for equations #2 & #3, a photo of track was used in Desmos.com to find points along the track to approximate the shape of the track to a "best-fitting" curve—(an equation for finding the length of the curved free-free-fall of the ride).

Results and Discussion

A=6.08 meters squared

u=0.15

$\rho = 1.225 \text{ kg/m}^3$

L=32.256 meters

The sources of error were:

- Error in point-finding for graph
 - Error in the approximating curve
 - Error in calculating the area
- The percentage of error was 5%

With better techniques and advanced equations Newtonian laws of motion are very accurate (proved with the 5% error in our particular choice of application) and we conclude that they're very accurate in general.

Acknowledgements

Professor. Thijs Heus

References

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