

The Best Amusement Park
1234 Fun Way
Playtown, MT 11235

Dear Calculus Student:

We are planning to build a roller coaster for our amusement park, and we need your help! We would like you to design the shape of our roller coaster. Unfortunately, the only space we have is a long, narrow area, so no twists or turns will be possible. Our available space measures 500 meters in length; we have already allowed for space for loading and unloading. The track must be a smooth curve and must be level at the beginning and ending to accommodate addition of track for loading and unloading. After the roller coaster crests the first hill, we would like for it to be powered by gravity alone.

We do have some limitations imposed by our insurance company. The highest point can be no more than 100 meters off the ground, and no loops are allowed. Furthermore, we cannot have any part be steeper than 70 degrees. Finally, so that the cars are able to remain on the track, for each meter traveled horizontally, the slope of the track can only change by 0.05.

Pictures are great sellers, so we would like to take pictures of the people on the roller coaster at the point where they have the greatest sensation of losing their stomachs. Please let us know where we will want the camera aimed for this shot, and why that spot will cause this sensation.

Our roller-coaster manufacturer just requires a function describing the shape of the roller coaster, and a plot of this function for verification. We would appreciate a full report describing your rationale for why this will be a great roller coaster and verifying that all of our requirements are met by your design. And since we are planning to build other amusement parks, if you could describe how you created the design for our roller coaster, we may be able to design our own rides in the future without having to trouble other calculus students.

Thank you so much for your help!

Sincerely,

TBAP