

Directions: Solve the following problem using multi-variable calculus. You can use any source (books, internet or people) provided that you properly cite it. Your solution should be in the form of a type-written report with proper spelling, grammar and punctuation. You can be creative as you like, but it must not simply be a list of formulas, rather a communication in writing of mathematical ideas using words.

Devious Dingo
Bleached Bone, Australia
March 7, 2005

Math 223 Students
Concordia College
Moorhead, MN 56562

Dear Calculus Students:

Oh, the pain and agony. Day after day. Week after week. Year after year. I keep trying. But I just keep failing. After much experimentation, I've decided to focus on one method for gathering the main ingredient of my Aunt Edna's famous Emu Souffle: I'll use my handy catapult to hurl an anvil and squash the fowl as it comes around a blind curve. When I went looking for help in my endeavors, your enterprising and resourceful instructor naturally referred me to you.

One of the complicating factors in cartoon land that you may not be aware of is that gravity not only has a vertical component, but also has a horizontal component. I'm a pretty smart carnivore, and I think could adapt my catapulting technique to this except that GRAVITY KEEPS CHANGING! You know the way there are tide tables that tell you when high tide and low tide are? Well, here we have gravity tables that tell us what the horizontal and vertical components of gravity will be. There is *some* consistency in that gravity is always pulling down and toward the west.

So here's my plan: I can set up the catapult near the blind curve due west of the location in the road where the Emu will be able to see me for the first time. Obviously, I'd like to squash the Emu at that spot in the road, and I'd like to be as far west as possible to increase the element of surprise. What I need to know is how far away I should set up the catapult and the angle that I should launch the anvil. Since I will launch it due east and gravity is pulling due west, I *really* want to avoid the classic anvil-goes-up-in-the-air-and-lands-on-poor-Devious-turning-him-into-an-accordion scenario. I'd like to know what angle I should ABSOLUTELY POSITIVELY avoid to escape this fate.

As regular as clockwork, the Emu zips down the road on Saturday mornings at 11:00 AM. I plan on launching my attack on December 10 (at 11:00 AM, of course) when gravity will be pulling down at a rate of 9.8 m/s^2 and to the west at a rate of 2.1 m/s^2 . By the way, my trusty Acme catapult can launch an average-sized anvil at 45 meters per second.

I've been down the road enough times before (pun intended) to realize that everything may not go exactly as planned on the 10th. Since the gravity is not always the same at 11:00 on Saturday mornings, I would like formulas for each of my questions that depend

only on the horizontal and vertical components of gravity. That way, I'll still be able to try my attack on another day.

In order to give me time to fine tune my instruments of destruction, I will need your report by December 2. Please don't let me down. Aunt Edna has been waiting a long time for this.

Hungry as ever,
Devious Dingo

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