Math 53: Multivariable Calculus **Sections 212, 213**

Worksheet for 2020-09-18

Questions marked with ** are less relevant to the core material and/or more difficult.

Problem 1. A hill is described by the equation

$$z = 50 - 2x^2 + 4x - y^2 - 6y.$$

(a) What are the x and y coordinates of the peak of this hill? (Hint: the tangent plane is horizontal at the peak.)

(b) A person starts at the point $(-3, 0, 20)$ and goes directly towards the peak—meaning their path when viewed from above looks like a straight line. At the point $(-3, 0, 20)$, how steep is their path?

(c) There is a level road around the mountain at elevation $z = 20$ (where the person started walking). What angle is formed between the person's path and the road in $\mathbb{R}^3$? (I didn't try to make the numbers work out nicely so expect inverse trig functions in your final answer.)

Problem 2. The cone $x^2 + y^2 = z^2$ intersects the plane $2x + 3y + z = 23$ in a curve C.
Verify that the point $(3, 4, 5)$ lies on C, and find the tangent line to C at that point.
**What kind of curve is C?