Fall 2025 **Math 53, Sections 104/106**

Discussion #4

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1. Describe the level sets of the following functions:
   (a) $f(x) = \tan x$.
   (b) $f(x, y) = \tan x$.
   (c) $f(x, y) = \ln(x - y) + \ln(x - 5)$. What is the union of the level sets here?
   (d) $f(x, y, z) = x^2 + 2y^2 + 3z^2$.
2. What is the velocity of a particle moving along $r(t) = (3t, 4 - t^2, \sin t)$ when $t = 0$? What about the speed? What if instead the velocity was $v(t) = \langle 3t, 4 - t^2, \sin t \rangle$ with initial position at the origin, and we want to know the position at $t = 1$?
3. Write down an explicit tangent line for each point of the curve $r(t) = (4t, 5 - t^3, \sin t)$.
4. Parameterize the intersection of the surfaces $z = x^2 + y^2$ and $y + z = 1$ in $\mathbb{R}^3$.