Name: _____

Test Prep — 14.1 and 14.3 — Math 126

Participation:

- +1: show written work from your 13.4 homework
- +1: participate in this test prep

Page 1 — Derivative Review
Try these on your own, then compare with classmates, then confirm with your TA.

- $\frac{d}{dx}(\cos^3(x))$
- $\frac{d}{dx}\left(\frac{e^x}{1+x^3}\right)$
- $\frac{d}{dx}(x\sin^{-1}(x))$
- $\frac{d}{dx}\left(\frac{\sqrt{x}}{10}-\frac{4}{3x^2}+5^x\right)$
- Find $\frac{dy}{dx}$ for $x^2+y^3+x^4y=4$

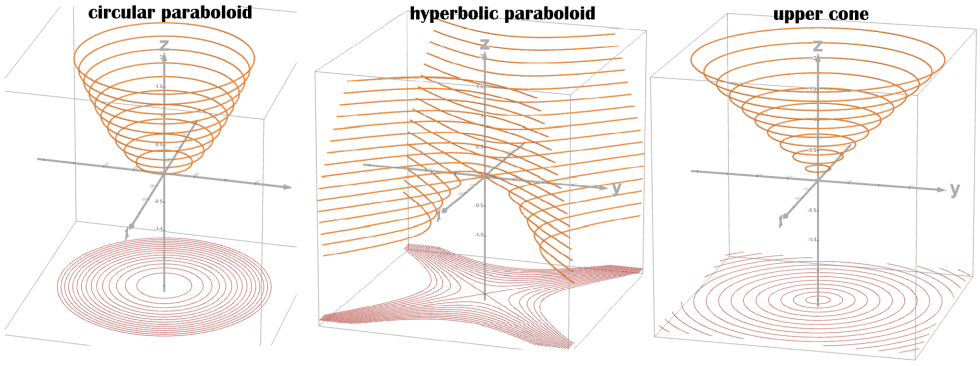
Partial Derivatives (New Idea)
In 14.3, we treat one variable as changing and the others as constants.
Let $z=f(x,y)=x^2y+y^4-x^3$

- Find $\frac{\partial z}{\partial x}$
- Find $\frac{\partial z}{\partial y}$

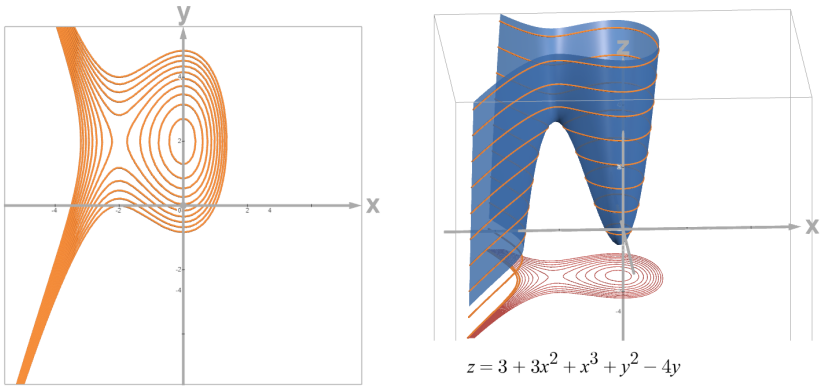
Page 2 — Contour Maps and Surfaces (14.1)

Key Idea: A **contour map** is made by choosing values $z = k$ and graphing the corresponding curves in the xy-plane.

Look at the examples of three quadric surfaces and their contour maps below, then discuss with classmates. Note how the cone and circular paraboloid have circular level curves, but that the parabolas circles get closer together as we go outward. Note that the center of the circles correspond to a minimum point. For the hyperbolic paraboloid, notice that the level curves 'cross', we call that point at the origin a 'saddle point', any guesses at why?



Now consider $z = f(x, y) = 3 + 3x^2 + x^3 + y^2 - 4y$. The contour map and surface are shown below...



Try this: Compute $\frac{\partial z}{\partial x}$ and $\frac{\partial z}{\partial y}$. Then solve for when BOTH are zero. Do these match key features of the contour map?

We'll come back to this idea soon (this is a key idea in 14.3, 14.4 and 14.7)

Sections 14.3 and 14.7 are the big assignments and conceptual ideas in chapter 14. Try to get done with 14.1 as soon as you can so that you can start 14.3 after lecture. Now go ask lots of 14.1 HW questions!