Gradient and Directional Derivatives

Reading

Sections 15.5

Problems

- Practice Problems 15.5: 1, 2, 5, 9, 13, 17, 23, 31, 35
- Problems to turn in 15.5: 6, 10, 24, 32, 36

Topics to know

1. Definition of gradient vector
2. Draw gradient vectors for a function like $f(x, y) = x^2 + y^2$
3. Algebraic properties of gradient (theorem 1)
4. Chain rule for gradients: $F(f(x, y, z))$
5. Chain rule for paths: $f(\vec{c}(t))$, $\vec{c}(t) = \langle x(t), y(t), z(t) \rangle$
6. Proof of the chain rule for paths (page 821)
7. Gradient is perpendicular to level curves
8. Definition of directional derivative along the direction of a unit vector
9. Directional derivative formula via gradient
10. Directional derivative related to the angle between vector and gradient (theorem 4)
11. Consequences of theorem 4