Math 340, Jeffrey Adams

Review, Chapters 4-6, November 15, 2010

1. Chapter 4
   (a) Section 1: Derivative of $f : \mathbb{R} \to \mathbb{R}^n$, parametrized curves, velocity, speed and acceleration
   (b) Section 2: Graph of $f : \mathbb{R}^n \to \mathbb{R}$
   (c) Section 3: Partial derivatives of $f : \mathbb{R}^n \to \mathbb{R}$
   (d) Section 4: Parametrized surfaces, $f : \mathbb{R}^2 \to \mathbb{R}$
2. Chapter 5
   (a) Section 1: Topology: open/closed sets, interior, boundary, limits; Definition of continuous function $f : \mathbb{R}^m \to \mathbb{R}^n$
   (b) Section 2: Definition of differentiable function $\mathbb{R}^n \to \mathbb{R}$, derivative of $f(\vec{x})$, gradient, tangent approximation
   (c) Section 3: Directional derivative of $f : \mathbb{R}^n \to \mathbb{R}$, $\frac{\partial Rf}{\partial \vec{u}} = \nabla(f) \cdot \vec{u}$; mean value theorem
   (d) Section 4: Differentiable functions $f : \mathbb{R}^n \to \mathbb{R}^m$, derivative is an $m \times n$ matrix; tangent approximations
3. Chapter 6
   (a) Section 1: vector fields, gradient vector fields
   (b) Section 2: chain rule for $\mathbb{R}^n \xrightarrow{f} \mathbb{R}^m \xrightarrow{g} \mathbb{R}^p$, $(g \circ f)(\vec{x}) = g'(f(\vec{x}))f'(\vec{x})$
   (c) Section 3: Implicit differentiation, $F(\vec{x}, G(\vec{y})) = 0, \ldots$
   (d) Section 4: Critical points $\nabla f(\vec{x}) = 0$, local min/max, absolution min/max; local min/max in the interior; local min/max with constraints, Lagrange method; second derivative
   (e) Section 6: polar, spherical, and cylindrical coordinates