Calculus III Final Review: Study all old tests and worksheets on our class website

Section 1.2 Vectors:

- Be able to add vectors both pictorially and component wise
- Given 2 points A and B, find the vector that goes from A to B
- Find the magnitude of a vector, find unit vectors
- Find the resultant force, find tension
- Examples p.34: 1,2, 3, 5,14. Also look at the examples from class, webassign,
  and examples 7 & 8 from the textbook

Section 1.3 The Dot Product:

- Know both definitions of the dot product
- Be able to determine if 2 vectors are perpendicular
- Be able to find work
- Be able to find the angle between 2 vectors
- Examples p. 54: 4,7,9,15,17

Section 1.4 The Cross Product:

- Know the definition and that **a**x**b** is orthogonal to both **a** and **b.**
- Be able to determine if 2 vectors are parallel
- Be able to find the area of a parallelogram
- Be able to find the volume of a parallelepiped
- Examples p. 70: 3,7,13,17,20,22,23,27

Section 1.5 Equations of Lines and Planes

- Know both vector and parametric equations of lines
- Be able to determine if two lines are parallel, intersecting, or skew
- Know the scalar equation of the plane
- Look at the Equations of Lines & Planes and problems from in class

- Examples p. 96: 2,3,5,7, 9,10,11,12, 13,14,15,16,17,19,23

Section 2.2 Parametrized Curves in Space

- Find the velocity, speed, and acceleration given a position vector
- Find position, velocity, and speed given acceleration, Projectile Problems
  Examples p. 38: 19, 21,27, also look over examples from in class, webassign and
  examples 8,9, and 10 from the textbook

Section 2.3 Fundamental Quantities Associated with a Curve

Find the tangent vector and unit tangent vector
Be able to find the angle between two curves
Be able to find arc length

- Examples p. 68: 9 also look over in-class examples, webassign, and the Arc Length Worksheet

Section 3.2 Limits and Continuity:

□□□ Be able to show a limit does not exist
□□□□□Know the definition of continuity
Be able to find the limit of a function when it exists
Examples p. 24: 1,11,13,15,17,18 (without hint),19,20. Also look at the Limits Worksheet

Section 3.3 Partial Derivatives:

Know Clairaut's Theorem
Be able to take partial derivatives Partial Derivatives Worksheet
Know how to find the equations of the tangent plane and the normal line
Examples p. 48: 1,5,9,11,14,17,19

Section 3.5 Directional Derivatives and the Gradient Vector

Be able to find the derivative of f in the direction of a vector v, be able to take the derivative in the direction from a point P to Q

Know how to maximize the directional derivative

See the Worksheet on Directional derivatives

Examples p. 85: 7,8,9,10,11,13 Also look over the examples from in class and webassign

Section 3.6 Optimization

Know the 2nd Derivative Test

Be able to identify local maxs, mins, and saddle points (Refer to the Worksheet on Max/Min)

Examples p. 24: 3,5,11,13,15. Also look over in class examples

Section 4.1 Double Integrals over Rectangles:

- Know the definition of a double integral
- Be able to set up and evaluate double integrals over a rectangular region R
- Be able to set up & integrate double integrals over a region D
- Be able to find volumes using double integrals
- Be able to sketch a region D and change the order of integration
- Examples p. 34: 3, 5, 9,11,12,13,15, 17 and the problems from in class and webassign.

Double Integral practice

Section 4.2 Applications of Double Integrals

- Given a density function, be able to find the mass, moments, and center of mass of a lamina. Find the average value of f(x,y) over D
- Examples p. 50: 3,9, 15, 23

Section 4.3 Triple Integrals:

- Be able to set up and evaluate triple integrals, find volume using triple integrals, and find mass and center of mass of a solid F given a density function. Know the average value of f(x,y,z) over the region F
- Examples p. 32: 8,11,17,19,21

Triple Integral Practice

Section 5.1: Double Integrals in Polar Coordinates

- Know how to change from rectangular to polar coordinates
- Examples p. 19: 1,3,5,7,9,11,12,17

Polar Coordinate Practice
More Help with Polar Coordinate Bounds

Section 5.2: Triple Integrals in Cylindrical Coordinates

- Know how to convert from rectangular to cylindrical coordinates
- Examples p. 32: 7,12,13,21, and the problems from in class and webassign

Section 5.3: Triple Integrals in Spherical Coordinates

- Know how to convert from rectangular to spherical coordinates
- Examples p. 44: 5, 9,10,11,13, and the problems from in class and webassign.

Triple Integral Worksheet

Section 6.1 Vector Fields:

- Be able to find the gradient vector field of f

Section 6.2 Line Integrals:

- Know how to find the line integral of f along a curve C in $\mathbf{R^2}$

or $\mathbf{R}^3$

- Be able to calculate the mass of a wire using line integrals
- Be able to find a parametric representation for a line segment, a circle, y=f(x), x=g(y)
- Examples p 25: 3, 5, 11, and the examples from class.
  More Line Integral Practice

Section 6.3 Line Integrals of Vector Fields:

- Understand the definition of path independence (p. 36)

- Find the line integral of a vector field **F** along C
- Be able to state the result of the Fundamental Theorem for Line Integrals (p.35)
- Show **F** is or is not conservative (curl **F**= **0**)
- Given a conservative function **F** find its potential function f
- Find the work done by a vector field **F** moving an object along a curve C
- Examples p. 47: 1, 5, 11,13 and from in class/webassign
- Worksheet for finding a potential function

Section 6.5 Surface Integrals

- Be able to find the surface area of a parametric surface (Examples p. 91:1,3,5 and in class)
- Be able to find the mass of a parametric surface
  (Examples p. 91: 9,11,15—remember if f(x,y,z) represents density we would be finding mass)
- Be able to find the flux through parametric surface
  (Examples p. 91: 17,19,21)
  Surface Integrals Worksheet

Section 7.3 Green's Theorems

- Be able to apply Green's Theorem for Circulation (the formula will be given)

- Examples p.45: 13,15

Section 7.4 Stokes' Theorem

- Be able to apply Stokes' Theorem (the formula will be given)
- Examples p.57: 3,5,7, and the examples from in class
  Stokes Worksheet

Section 7.5 The Divergence Theorem

- Be able to apply the Divergence Theorem (the formula will be given)

- Examples p.73: 7,9,11 and the examples from class