Final Exam Material and Expectations

For the final exam, you should be able to do the following things:

Chapter 3.

- Do all the basic integrals expected of you in Calc I, including ones with u-substitution
- Use Integration By Parts to successfully integrate functions
- Use Partial Fraction Decomposition to successfully integrate functions
- Use trig identities to successfully integrate products/quotients/powers of trig functions
- Use Trigonometric Substitution to successfully integrate functions
- Diagnose an integral to select which method of integration to use
- Compute improper integrals using antidifferentiation and taking limits
- Approximate values of definite integrals using Trapezoid Rule, or Simpson's Rule

Chapters 2 & 4.

- Write (and possibly compute) an integral representing the arc length of a curve
- Write (and possibly compute) an integral representing the surface area of a solid of revolution about either x-axis or y-axis
- Solve separable differential equations and/or initial value problems

Chapter 5.

- Determine convergence or divergence of a sequence
- Given a convergent recursively defined sequence, compute the limit
- Identify a geometric series and determine its convergence and sum
- Identify a telescoping series and determine its convergence and sum
- Identify a p-series and determine its convergence
- Use the Basic Test for Divergence to successfully identify certain divergent series (but realize that it does not work for all divergent series, and never tells us anything about convergent series)
- Use the Integral Test to successfully determine convergence of series
- Use the Comparison Test to successfully determine convergence of series
- Use the Limit Comparison Test to successfully determine convergence of series
- Use the Ratio Test to successfully determine convergence of series
- Use the Root Test to successfully determine convergence of series
- Use the Alternating Series Test to successfully determine convergence of alternating series
- Use tests to determine absolute convergence or conditional convergence of alternating series
- Diagnose a series to select a convergence test to use

Chapter 6.

- Find the radius of convergence and interval of convergence of a power series
- Use algebra and calculus manipulations of the geometric series and exponential series to express different functions as power series
- Given a power series, write the power series representation of its derivative or antiderivative
- Write the Taylor series of a function centered at a
- Determine the radius of convergence of a Taylor series of a function
- Write Taylor polynomials centered at a for a function

Chapter 7.

- Understand a curve expressed by parametric equations
- Understand polar curves as parametrizations
- Compute tangent lines to parametric curves
- Write (and possibly compute) an integral representing the area under a parametric curve
- Write (and possibly compute) an integral representing the arc length of a parametric curve
- Write (and possibly compute) an integral representing the surface area of a solid resulting when a parametric curve is revolved about an axis
- Write (and possibly compute) an integral representing the area bounded by a polar curve
- Write (and possibly compute) an integral representing the arc length of a polar curve
- Given a polar equation defining a conic section, find the eccentricity of the conic
- Use the eccentricity of a conic section to classify what type of conic it is

Derivatives and Integrals To Know.

- You should definitely still have the following memorized:

(i)	$\frac{d}{dx}\left(x^n\right) = nx^{n-1}$	$\int x^n \ dx = \frac{x^{n+1}}{n+1} + C$
(ii)	$\frac{d}{dx}\left(\sin(x)\right) = \cos(x)$	$\int \cos(x) \ dx = \sin(x) + C$
(iii)	$\frac{d}{dx}\left(\cos(x)\right) = -\sin(x)$	$\int \sin(x) \ dx = -\cos(x) + C$
(iv)	$\frac{d}{dx}\left(e^x\right) = e^x$	$\int e^x \ dx = e^x + C$
(v)	$\frac{d}{dx}\left(\ln(x)\right) = \frac{1}{x}$	$\int \frac{1}{x} \ dx = \ln(\lvert x\rvert) + C$
(vi)	$\frac{d}{dx}\left(\tan^{-1}(x)\right) = \frac{1}{1+x^2}$	$\int \frac{1}{1+x^2} \ dx = \tan^{-1}(x) + C$

- Additionally, you should know:
  - $\frac{d}{dx}\left(\tan(x)\right) = \sec^2(x)$ $\qquad$ $\frac{d}{dx}\left(\sec(x)\right) = \sec(x)\tan(x)$
- Finally, you may want to either memorize or remember the process of finding the integrals of the following functions:
  $\tan(x)$, $\sec(x)$, b^x, $\log_b(x)$.