Preparing for the final exam

(1) Basics of sequences & series
  - Notation for sequences
  - Notation for summation / series
  - Basic summation identities & how to use them

(2) Series
  - What the basic ideas of infinite series is/are.
  - Everything about geometric series.
  - Telescoping sums & partial fractions.
  - How to determine convergence/divergence using direct comparison, integral comparison, etc.
  - How to give over/under estimates for partial sums and for remainders.
  - Absolute vs. conditional convergence.
  - The ratio test.

(3) Taylor polynomials & series
  - What a Taylor polynomial is; what a Taylor series is; what the difference is.
  - How to find the formulas for Taylor polynomials/series directly from the formula
  - How to find formulas for Taylor polynomials/series by modifying existing formulas
  - Issues of convergence: How to determine the radius of convergence, etc.

(4) Tools for integration
  - ♡ Integration by parts
  - Change of variables
  - Partial fractions
  - Completing the square
  - Basics of integration in the presence of trigonometry.
  - Hyperbolic trigonometry, while awesome, will not be featured on the final exam. ☹

(5) Geometric integrals:
  - How to find the area, and geometric centers, of circles, ellipses, etc.
  - How to find the volume, and geometric centers, of cones, pyramids, etc.

(6) Basics of probability.
  - What a probability distribution is... both discrete (sequences) and continuous (functions).
  - Definitions of the mean and standard deviation for continuous probability distributions and discrete probability distributions

Here are some things which I expect you to have memorized:

- The Taylor series for e^x, $\cos x$, $\sin x$, and $\frac{1}{1-x}$.
- The anti-derivatives

$$\int \frac{1}{1+x^2}\,dx, \quad \int \frac{1}{1-x^2}\,dx \quad \int \frac{1}{\sqrt{1-x^2}}\,dx$$

- The summation formulas for

$$\sum_{k=1}^{n} k, \quad \sum_{k=0}^{n} x^k$$

Here is a list of formulas I will provide:

- The anti-derivatives

$$\int \frac{1}{\sqrt{x^2 \pm 1}}\,dx = \ln|x + \sqrt{x^2 \pm 1}| \quad + C$$

- The summation formulas

$$\sum_{k=1}^{n} k^2 = \frac{n(n+1)(2n+1)}{6}, \qquad \sum_{k=1}^{n} k^3 = \frac{n^2(n+1)^2}{4}.$$