Study me!
- Inverse trig functions and their derivatives
- Hyperbolic functions, their derivatives, and the primary identity (between coshx and sinhx)
- The 4 categories, 7 types of indeterminate forms (limits) and how to prepare them for L’Hospital’s Rule
- The 5 different methods of integration we know how to use
  - U-substitutions
  - Integration by parts: the formula and how to choose your u and dv
  - Trig integrals: the Pythagorean identities, half and double angle formulas, and how to choose your u
  - Trig subs: the 3 cases and substitutions, and how to use a triangle to get back to original variable
  - Partial fractions: long division, what to do with irreducible quadratics and repeated factors
- How to integrate tanx, secx, cscx, cotx
- The two types of improper integrals, the “p-test”, and the Comparison Theorem
- How to find the area between two curves, and how to graph common curves
- How to find the volume of a solid of revolution by using the disk method

Problems
A. Calculate the following limits.

1. \( \lim_{{x \to \infty}} \frac{\sec(\tan^{-1} 2x)}{x} \)

2. \( \lim_{{x \to 0}} (xe^{\sin x} - x) \)

3. \( \lim_{{x \to 0^+}} (\sin 2x)^x \)
B. Evaluate the following integrals.

4. \[ \int e^x \sin(mx) \, dx \]

5. \[ \int x^3 \cos(x^3) \, dx \]

6. \[ \int \sin^5 x \cos^2 x \, dx \]

7. \[ \int \tan^5 x \, dx \]
8. \[ \int \frac{x^2}{\sqrt{6x-x^2}} \, dx \]

9. \[ \int_{0}^{1} \frac{r^3}{\sqrt{4+r^2}} \, dr \]

10. \[ \int \frac{x^2 + 2}{x^3 - x^2 + x - 1} \, dx \]
C. Only 4 more to go!

11. Compute \( \int_{0}^{\infty} \frac{1}{x \ln x} \, dx \) or show that it diverges.

12. Determine whether \( \int_{0}^{\infty} \frac{2 + \sin x}{\sqrt{1 + x^2 + x^4}} \, dx \) converges or diverges.

13. Find the area of the region bounded by \( y = x^2 \), the tangent line to the curve at \((1, 1)\) and the x-axis.

14. Set up but DO NOT EVALUATE an integral for the volume of the solid obtained by rotating the region enclosed by \( y = x^3 \) and \( y = \sqrt{x} \) about \( y = 0 \).