Final Exam

Jan 13 2005, 10:10 AM
Show all your work

1. (Fundamental Theorems of Calculus)

   State the Fundamental Theorem of Calculus.
   Compute $\frac{d}{dx}\int_x^{2x} e^{\sqrt{y^2+1}}dy$.

2. (Express Integrals as limit of Riemann Sum and vice versa)

   Find
   $$\lim_{n\to\infty}\sum_{i=1}^{n}\exp(\frac{i}{n})\cdot\frac{1}{n}$$

3. (Area, length of curves, volume and surface area of revolution + Method of slicing)

4. (Convergence and divergence of improper integrals)

   Which of the following improper integrals converge and which of them diverge? Explain.

   (a): $\int_1^{\infty}\frac{1}{\sqrt{x^2+x}}dx$
   (b): $\int_1^{\infty}\frac{\ln x}{x^2}dx$

5. (Separable and linear ODEs)

6. (Various techniques of integration. One problem for each)

7. (Statement and applications of convergence tests for nonnegative series)

   State integral test, ratio test and root test.