

Exam preparation questions for Math 1220

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1. Solve for y :

$$\frac{dy}{dx} + \tan(x)y = 2^x \cos(x).$$

2. Find $\int \frac{e^x}{\sqrt{9 - e^{2x}}} dx$.

3. Find $\int \frac{5x^2 + x}{(x^2 + x + 1)(2x - 1)} dx$.

4. Find $\int_1^\infty \frac{1-x}{e^x} dx$.

5. Show that $\sum_{n=1}^\infty \frac{\ln(n)}{n^2}$ converges. Estimate the error between the sum of the series and its 20th partial sum.

6. Find the convergence set of the power series $\sum_{n=0}^\infty \frac{(-1)^n x^n}{5n}$.

7. Find the Maclaurin series of $\tan^{-1}(x)$ and determine its radius of convergence (hint: integrate the Maclaurin series for $\frac{1}{1+x^2}$).

- Bonus: Show that $\sum_{n=2}^\infty \frac{(-1)^n}{\ln(n)}$ converges. Estimate the error between the sum of the series and its 100th partial sum.