

Math 115 Exam #2 Practice Problems

1. Find the Maclaurin series for $\tan^{-1}(x)$ (feel free just to write out the first few terms).
2. Use the first two non-zero terms of an appropriate series to give an approximation of

$$\int_0^1 \sin(x^2) dx.$$

Give (with explanation) an estimate of the error (the difference between your approximation and the actual value of the integral).

3. Find the limit

$$\lim_{x \rightarrow 0} \frac{\sin x^2}{1 - \cos 2x}$$

without using L'Hôpital's Rule.

4. Find the Taylor series for e^{-x^2} centered at 0. What is the interval of convergence for this series?
5. Find the Maclaurin series for

$$\int_0^x \cos t^3 dt.$$

6. Write out the first five terms of the Taylor series for \sqrt{x} centered at $x = 1$.
7. Find the Maclaurin series for $f(x) = \frac{1}{1+2x^2}$. What is its interval of convergence?
8. Plugging in $x = 1$ to the Maclaurin series for e^x , we can write e as

$$e = \sum_{n=0}^{\infty} \frac{1}{n!}.$$

How many terms are necessary to approximate e to within $\frac{1}{8}$? You may take it as known that $e \leq 3$.

9. Find all the sixth roots of -1 .
10. Write $\sqrt{3} - i$ in polar form.