Math 142
Calculus II
Fall 2001, USC

Dec 12, 2001

Final Exam

Time: 180min

Note: Justify all your answers.

1. (10 pts) Find dy/dx:

a) $y = x^{\tan x}$ **b)** $y = \sin^{-1} x$

2. (20 pts) Find

a) $\displaystyle\int \frac{1}{x^2+4x+13}\,dx$ **b)** $\displaystyle\int \sin^4 x\,dx$

c) $\displaystyle\int \ln(2x)dx$ **d)** $\displaystyle\int \frac{1}{x^2+4x-5}\,dx$

3. (15 pts) Find

a) $\displaystyle\lim_{x\to\infty}\left(1+\frac{1}{x}\right)^x$ **b)** $\displaystyle\lim_{x\to 0} x^{\frac{1}{x}}$ **c)** $\displaystyle\lim_{n\to\infty}\frac{2^n}{n!}$

4. (5 pts) Write the following number as as the ratio of two integers.

$$1.234444444\ldots$$

5. (20 pts) Determine whether or not the following series converge.

a) $\displaystyle\frac{1}{2^2}+\frac{2}{2^3}+\frac{3}{2^4}+\frac{4}{2^5}+\cdots$ **b)** $\displaystyle\sum_{n=1}^{\infty}\frac{\ln n}{n}$

c) $\displaystyle\sum_{n=1}^{\infty}\frac{n^2+7}{n^3\sqrt{n+7}}$ **d)** $\displaystyle\sum_{n=1}^{\infty}(-1)^n\frac{n^2}{e^n}$

6. (10 pts) Find the Maclaurin series for e^x and compute its radius of convergence.

7. (10 pts) Find the equation of the parabola whose vertex is the origin and whose axis is the y-axis and passes through the point $(-3, 5)$.

8. (10 pts) Find the sum of the alternating harmonic series.

LaTeX ..... $\mathcal{MG}$