Fall 2001, Exam 4, Math 142

PRINT Your Name:_____

There are 10 problems on 5 pages. Each problems is worth 10 points. SHOW your work. $\boxed{CIRCLE}$ your answer. **NO CALCULATORS!** If you want to pick up your exam before Monday, write a short note to that effect on the top of this page and I will leave your exam outside my office door, before I go home tonight.

1. Does $\displaystyle\sum_{n=1}^{\infty} \frac{4}{n}$ converge? Justify your answer.

2. Does $\displaystyle\sum_{n=1}^{\infty} \frac{n+3}{n^2\sqrt{n}}$ converge? Justify your answer.

3. Does $\displaystyle\sum_{n=1}^{\infty} \ln\left(\frac{n}{n+1}\right)$ converge? Justify your answer.

4. Does $\displaystyle\sum_{n=1}^{\infty} (-1)^{n+1}\frac{1}{n^2}$ converge? Justify your answer.

5. Does $\displaystyle\sum_{n=1}^{\infty} \frac{4^n+n}{n!}$ converge? Justify your answer.

6. Express $9.12323232\overline{23}\ldots$ as a fraction. Justify your answer.

7. Where does $f(x) = \displaystyle\sum_{n=0}^{\infty} (-1)^{n+1}\frac{x^{2n+1}}{(2n+1)!}$ converge? Where does $f(x)$ diverge? Justify your answer.

8. Where does $f(x) = \displaystyle\sum_{n=1}^{\infty} (-1)^{n+1}\frac{(x-1)^n}{2^n n(n+2)}$ converge? Where does $f(x)$ diverge? Justify your answer.

9. Which familiar function is equal to $x - \dfrac{x^2}{2} + \dfrac{x^3}{3} - \dfrac{x^4}{4} + \dfrac{x^5}{5} - \ldots$? Justify your answer.

10. Approximate $\displaystyle\int_0^{1/10} e^{-x^2}\,dx$ with an error of at most 10^{-8}. Justify your answer.