Math 1172
MIDTERM 2

Form A

NAME : ___ ___ ___ ___ ___ ___ ___ ___

OSU Name.# : ___ ___ ___ ___ ___ ___ __

Lecturer:: ___ ___ ___ ___ ___ ___ ___

Recitation Instructor : ___ ___ ___ ___

Recitation Time : ___ ___ ___ ___ ___ __

INSTRUCTIONS

Do all problems. Answer each part thoroughly.

SHOW ALL WORK! Incorrect answers with work shown may receive partial credit, but unsubstantiated answers will receive NO credit.
Give EXACT answers unless asked to do otherwise. You do not need to simplify numerical answers such as $\frac{5}{\sqrt{8}} - \frac{3}{\sqrt{32}}$.

Calculators are permitted EXCEPT those calculators that have symbolic algebra or calculus capabilities. In particular, the following calculators and their upgrades are not permitted : TI - 89, TI - 92, and HP - 49.
In addition, neither PDA's, laptops, nor cell phones are permitted.
Do not even have these devices out!

The exam duration is 55 minutes.

The exam consists of 5 problems starting on page 2 and ending on page 6.
Make sure your exam is not missing any pages before you start.
Tear off the formula sheet!

PROBLEM	SCORE
#1	(18)
#2	(22)
#3	(20)
#4	(20)
#5	(20)
TOTAL	(100)

1. (18 pts) Evaluate the integral.

$$\int_{2}^{\infty} \frac{1}{x^4 - 1}\, dx$$

2. (22) (I) Determine the interval of convergence of the series

$$\sum_{k=2}^{\infty} \frac{k\, x^k}{k\,!}\ .$$

(II) Find the Taylor series about a for the following functions :

(a) $f\,(x) = x^6\, e^{3\,x}$, $a = 0$

(b) $f\,(x) = \frac{d}{dx}\left(x^6\, e^{3\,x}\right)$, $a = 0$

(c) $f\,(x) = (x - 6)^2$, $a = 0$

(d) $f\,(x) = (x - 6)^2$, $a = 6$

#3 (20 pts) (a) Find the the first four nonzero terms of the Taylor series centered at $a = \frac{\pi}{3}$ for the function $f(x) = \cos x$.

(b) Use the first four terms of the series in part (a) to approximate $\cos\left(\frac{3\pi}{8}\right)$.

(c) Use the remainder term R_n to estimate the absolute error.

4. (20)

(I) Evaluate the geometric series, or state that it diverges.
Show your work!

$$\sum_{n=1}^{\infty} \frac{5^{n+2}}{2^{3n}}$$

(II) Determine whether the sequence is convergent or divergent.
If it is convergent, find its limit.

(a) $$a_n = \frac{\sqrt{n+1} - \sqrt{n-1}}{n}$$

(b) $$a_n = \left(1 + \frac{1}{7n}\right)^n$$

5. (20 pts) Consider the parametric curve $x = \ln t$, $y = \sqrt{t}$, $t \geq 1$.

(a) Find its rectangular (Cartesian) equation.

(b) Determine $\frac{dy}{dx}$ in terms of t and evaluate it at $t = e$.

(b) Make a sketch of the curve showing the tangent line at the point corresponding to the given value of t.