Calculus II - Fall 2014 - Mr. Clontz - PRACTICE Midterm

Name: ______________________________ 9am / 10am

About your midterm and this practice midterm:

- The first few questions will be multiple-choice questions covering basic definitions, theorems, and other concepts in sections 11.1-11.10, 7.1, and 7.2. These will total 10 points of the midterm, and are not covered by the practice midterm.
- The other 90 points of the midterm are based on 9 of the questions asked on this practice midterm. These questions will require full solutions and will be given partial credit based on the rubric for each question in this practice midterm. The rubric will not be given on the actual midterm.
- Minor errors in a solution not specifically covered by the rubric will have between 0 and 2 points deducted. Some problems may have solutions not outlined by the rubric - these will be graded as fairly as possible.
- A review for the midterm will be held on Friday, October 3 during lecture. Students will receive presentation credit for solving problems from the practice midterm.
- The midterm will take place during lecture on Monday, October 6. Up to ten bonus points will be awarded for turning in a printed copy of this practice midterm with full solutions before taking the midterm.

1. (10 points) Write the first five terms of the following sequence: $\left\{\dfrac{3n}{2^n}\right\}_{n=0}^{\infty}$

Compare with Ch 11 Problem 16.

Write a correct term of the sequence.	2 points each

2. (10 points) Find a general formula for the sequence $\left\{\frac{2}{3}, \frac{-4}{5}, \frac{8}{7}, \frac{-16}{9}, \frac{32}{11}, \ldots\right\}$.

Compare with Ch 11 Problem 17.

Formula yields correct denominators.	4 points
Formula yields correct numerators.	4 points
Formula yields correct signs (positive/negative).	2 points

3. (10 points) Determine whether the sequence $\left(\dfrac{1-n}{3n+7}\right)$ is convergent or divergent. If it is convergent, what does it converge to?

Compare with Ch 11 Problems 31-38.

Correctly identify as convergent/divergent.	2 points
If convergent, found correct value. If divergent, identifed as divergent.	2 points
Use correct techniques (factoring/L'Hopital/etc.) to compute limit.	6 points

4. (10 points) Does the series $\sum_{n=1}^{\infty} \frac{4^n}{5^{n-1}}$ converge or diverge? If it converges, give its sum.

Compare with Ch 11 Problems 53,54.

Identify as a geometric series.	2 points
Identify a and r.	2 points
Check if $\|r\| < 1$ or $\|r\| \geq 1$.	2 points
If $\|r\| \geq 1$, identify as divergent. If $\|r\| < 1$, use formula $\frac{a}{1-r}$ to compute sum.	4 points

5. (10 points) Determine whether or not $\sum_{n=1}^{\infty} \frac{(-1)^{n-1}}{n^{3/2}}$ is absolutely convergent, conditionally convergent, or divergent.

Compare with Ch 11 Problems 83,84.

Check the series of absolute values.	2 points
Identify series of absolute values as convergent/divergent.	2 points
If necessary, check original series and identify as convergent/divergent.	2 points
Identify series as absolutely convergent, conditionally convergent, or divergent.	4 points

6. (10 points) Determine whether the series $\displaystyle\sum_{n=2}^{\infty} \frac{\sqrt{n^5}}{n^3 - 3}$ converges or diverges.

Compare with Ch 11 Problems 94-99 and similar problems from earlier sections.

Use an identifiable series convergence test.	2 points
Use an appropriate series convergence test.	2 points
Correctly use the chosen series convergence test.	4 points
Identify series as convergent or divergent.	2 points

7. (10 points) Determine whether the series $\sum_{n=0}^{\infty} \frac{e^n}{(n+1)!}$ converges or diverges.

   See question #6 for details.

8. (10 points) Determine whether the series $\sum_{n=0}^{\infty} \frac{3+x^2}{x^2(x^2+1)}$ converges or diverges.

See question #6 for details.

9. (10 points) For what values of x is the series $\sum_{n=1}^{\infty} \frac{(2x+1)^n}{n^2}$ convergent? What is its radius of convergence?

Compare with Ch 11 Problems 103-107.

Use either the Ratio or Root Test as appropriate.	2 points
Find a correct inequality for convergent x-values, ignoring endpoints.	2 points
Correctly identify each endpoint as convergent/divergent.	2 points each
Give the correct radius of convergence.	2 points

10. (10 points) Give a power series representing the function $f(x) = \frac{2}{2-x}$ and its radius of convergence.

Compare with Ch 11 Problems 109-112.

Set up function in the form $\frac{a}{1-r}$.	4 points
Set up the geometric series $\sum_{n=0}^{\infty} ar^n$.	4 points
Give the radius of convergence.	2 points

11. (10 points) The function $f(x) = \frac{3x}{1-x}$ is represented by the power series $\sum_{n=0}^{\infty} 3x^{n+1}$. Give a power series representing the function $f'(x) = \frac{3}{(1-x)^2}$.

Compare with Ch 11 Problems 114-116.

Attempt to differentiate/integrate the given series as appropriate.	4 points
Correctly differentiate/integrate the given series as appropriate.	4 points
Give correctly formatted series for final answer.	2 points

12. (10 points) Find the Maclaurin series representing the function $f(x) = e^{2x}$.

Compare with Ch 11 Problems 119-122.

Use MacLaurin series formula.	2 points
Compute derivatives $f^{(n)}(x)$.	2 points
Find formula for $f^{(n)}(0)$ (possibly splitting up odds/evens).	4 points
Give correctly formatted series for final answer.	2 points

13. (10 points) Evaluate $\int 3x^2 \cos(x)\, dx$.

Compare with Ch 7 Problems 3-7.

Set up correct u and dv.	2 points
Compute correct du and v.	2 points
Apply integration by parts to get solvable $uv - \int v\, du$.	4 points
Find correct final answer (possibly using int. by parts multiple times).	2 points

14. (10 points) Evaluate $\int \tan^7(y)\sec^4(y)\,dy$.

Compare with Ch 7 Problems 9,10,14,15

Use correct trigonometric identities.	3 points
Rewrite integral with single trig function and its derivative.	3 points
Use u substitution to eliminate trig functions.	2 points
Find correct final answer.	2 points