Final Exam Sample

Date: ______________ Name: ________________________

Directions:

1. **Answer Any 10**. Each perfect solution carries 10 points. Circle the problems on the exam that needs to be graded.
2. Provide the answer in the method and the format the question requires.
3. Write down the answers legibly. Unrecognizable steps/works will not be considered for grading.
4. Simplify to the best possible and draw the necessary graphs. Showing the work is necessary and important.
5. Answers without the work will not receive any points. Each step in the process of arriving at the solution or answer matters the most than the final answer itself and STEPS DO MATTER.

"On my honor, as a Florida Gulf Coast University Student, I have neither given nor received any unauthorized assistance on this work."

SIGNATURE: ____________________________________

Qn 1: True or False: Circle T if its true, otherwise circle F

A. If both $\sum a_n$ and $\sum(-a_n)$ converges, then $\sum |a_n|$ converges. $\boxed{T\ /\ F}$.

B. If $\sum a_n$ diverges then $\sum |a_n|$ diverges. $\boxed{T\ /\ F}$.

C. Both sequence $\{\frac{1}{n}\}$ and series $\sum \frac{1}{n}$ diverges. $\boxed{T\ /\ F}$.

D. Ratio test confirms that the series $\sum a_n$ is convergent if $\lim_{n} \to \infty |\frac{a_{n+1}}{a_n}| = 1$. $\boxed{T\ /\ F}$.

E. If a convergent alternating series satisfies the condition $a_{n+1} \leq a_n$, then the absolute value of the reminder R_N satisfies $|R_N| \leq a_N$. $\boxed{T\ /\ F}$.

F. Suppose that $a_n, b_n > 0$, and $\lim_{n\to\infty}(\frac{a_n}{b_n}) = L$, where L is finite. Then the two series $\sum a_n$ and $\sum b_n$ both converge or diverge. $\boxed{T\ /\ F}$.

G. $\sum_{n=1}^{\infty} \frac{1}{n(n+1)} = \frac{1}{2}$. $\boxed{T\ /\ F}$

H. The series $\sum_{n=1}^{\infty} \frac{1}{2^n}$ is convergent. $\boxed{T\ /\ F}$

Qn 2: Find the volume of the solid generated by revolving the region bounded by curves $f(x) = \sqrt{x}, g(x) = x^2$ about $y = 1$.

Qn 3: Find the surface area of the surface formed by rotating the graph of the cure $y = x^2$ from $x = 0$ to $x = \sqrt{2}$ along the $y-$axis.

Qn 4: Find the center of the Mass of the lamina of uniform density $\rho = 1$ bounded by the graph of $f(x) = 4 - x^2$ and the $x-$axis.

Qn 5: Solve $\int x^5 \sin\left(\frac{x}{2}\right) dx$.

Qn 6: Solve $\int \sec^4 x \tan^3 x dx$.

Qn 7: Solve $\int \frac{1}{x^3 + 9x} dx$.

Qn 8: Determine whether the following series converges absolutely, conditionally or diverges with justification

(i) $\displaystyle\sum_{n=0}^{\infty} \frac{(-1)^n}{\sqrt{n+1}}$

(ii) $\displaystyle\sum_{n=1}^{\infty} \frac{\sin(n\pi)}{n^2}$

Qn 9: Consider the power series $\sum_{n=1}^{\infty}(-1)^n(4x)^n$. Using the appropriate test to find the radius of convergence and the interval of convergence.

Qn 10: Find the $P_5(x)$ of $f(x) = \cos^2(\frac{x}{2}) - \sin^2(\frac{x}{2})$ near $x = 0$.

Qn 11: (A) Find the Maclaurin series of $f(x) = \cos x$. [5 points]

(B) Using the series expansion of $\cos x$, find the series expansion of $x^2 \sin^2(2x)$. [5 points]

Qn 12: A curve C is defined by the parametric equations $x = t^2$ and $y = t^3 - 3t$. Find all the possible equations tangents at the point $(3, 0)$, if any. Also, determine where the curve is concave upward or downward.