SCORE_______________

1. If $\int_1^5 f(x)\ dx = 12$ and $\int_4^5 f(x)\ dx = 3.6$, find $\int_1^4 f(x)\ dx$.

[7.5 points]

2. A formula is given for the nth term a_n of a sequence $\{a_n\}$. Find its first 4 terms.

$$a_n = \frac{(-1)^{n(n+1)/2}}{n+1}$$

[5 points]

3. Write an expression for the nth term of the sequence

$$3, -1, \frac{1}{3}, -\frac{1}{9}, \frac{1}{27}, \ldots$$

[7.5 points]

4. Find the limits (if possible) of the following sequence.

$$a_n = \frac{2n^2 + 5n + 1}{4n^3 + 6n}$$

[7.5 points]

5. Set up but do not evaluate the integral that will produce the surface area of the solid formed by rotating the curve $f(x) = \cos^2 x$ on the interval $[0, \frac{\pi}{3}]$ about the x-axis.

[7.5 points]

6. Show that the following series converges absolutely.

$$\sum_{n=1}^{\infty} \frac{4^n}{(2n+1)^n}$$

[7.5 points]

7. Find the volume of the solid found by rotating the region bounded by

$$y = 1 - x^2, \quad y = 0$$

about the x-axis.

[7.5 points]

8. Determine if the following series is convergent or divergent.

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

[10 points]

9. Find the following:

$$\int_0^1 \frac{x-4}{x^2-5x+6}\,dx$$

[10 points]

10. Determine if the following series if convergent or divergent. If it is convergent, determine if it is conditionally or absolutely convergent.

(a) $\displaystyle\sum_{n=1}^{\infty} \frac{(-1)^{n-1}}{n^3}$

[7.5 points]

(b) $\displaystyle\sum_{n=0}^{\infty} n \left(\frac{1}{2}\right)^n$

[7.5 points]

11. Find the interval and radius of convergence for the following power series:

$$\sum_{n=0}^{\infty} \frac{x^n}{n}$$

[10 points]

12. Find a power series representation of the following function, centered at a = 0.

$$f(x) = \frac{1}{2 - x}$$

[7.5 points]

13. Use Simpson's Rule to approximate the given integral with $n = 4$:

$$\int_0^{\pi/2} \sqrt[3]{1 + \cos x}\, dx$$

[7.5 points]

14. Approximate f by a Taylor polynomial of degree 4 at the number $\pi/6$ and use Taylor's Inequality to estimate the accuracy of the approximation $f(x) \approx T_4(x)$ when x lies in the interval $[0, \pi/3]$.

$$f(x) = \sin x$$

[10 points]