

Record your answers to the multiple choice problems by placing an \times through one letter for each problem on this page. There are 12 multiple choice questions worth 7 points each. You start with 16 points.

You may not use a calculator.

1. a b c d e2. a b c d e3. a b c d e4. a b c d e5. a b c d e6. a b c d e7. a b c d e8. a b c d e9. a b c d e10. a b c d e11. a b c d e12. a b c d e

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1. a b c d e

2. a b c d e

3. a b c d e

4. a b c d e

5. a b c d e

6. a b c d e

7. a b c d e

8. a b c d e

9. a b c d e

10. a b c d e

11. a b c d e

12. a b c d e

1. Determine which statement best applies to the series $\sum_{n=1}^{\infty} (-1)^{n+1} \frac{2n^2 - 1}{3n^2 + 1}$.

- (a) *Converges by the Integral Test*
- (b) *Converges by the Comparison Test*
- (c) *Diverges by the Divergence Test*
- (d) *Diverges by the Ratio Test*
- (e) *Converges by the Alternating Series Test*

2. Determine the interval of convergence for the power series $\sum_{n=1}^{\infty} \frac{(x+1)^n}{n 4^n}$.

- (a) $-3 \leq x \leq 5$ (b) $-5 \leq x < 3$ (c) $-3 \leq x < 5$ (d) $-5 < x < 3$ (e) $-5 < x \leq 3$

3. Determine which series *converge*.

(I) $\sum_{n=2}^{\infty} \frac{1}{n[\ln(n)]^2}$ (II) $\sum_{n=1}^{\infty} \frac{\sin(n)}{n\sqrt{n}}$ (III) $\sum_{n=0}^{\infty} \sqrt{\frac{2n+1}{n^3+1}}$

- (a) (I) and (III) (b) (II) (c) (I) and (II)
- (d) (II) and (III) (e) (I), (II) and (III)

4. Calculate the sum $\sum_{n=1}^{\infty} (\tan^{-1}(n) - \tan^{-1}(n+1))$ by finding the limit of the m -th partial sum.

- (a) *diverges* (b) $-\pi/4$ (c) 2 (d) $\pi/2$ (e) 1

5. Find the sum $\frac{2+3}{4} + \frac{2^2+3^2}{4^2} + \frac{2^3+3^3}{4^3} + \dots$.

- (a) 4 (b) 3 (c) 1 (d) 2 (e) 5

6. Find the Taylor series for $f(x) = x^4 + x^2 + 1$ centered at $a = 1$.

(a) $1 + 5(x - 1) + 6(x - 1)^2 + 4(x - 1)^3 + (x - 1)^4$

(b) $3 + 6(x - 1) + 14(x - 1)^2 + 24(x - 1)^3 + (x - 1)^4$

(c) $3 + 6(x - 1) + 7(x - 1)^2 + 4(x - 1)^3 + (x - 1)^4$

(d) $3 + 7(x - 1) + 9(x - 1)^2 + 5(x - 1)^3 + (x - 1)^4$

(e) $1 + (x - 1)^2 + (x - 1)^4$

7. Determine which phrase applies to the series $\sum_{n=1}^{\infty} (1 - \sqrt[n]{2})^n$.

(a) *diverges*

(b) *converges conditionally*

(c) *is not alternating*

(d) *has an infinite radius of convergence*

(e) *converges absolutely*

8. Determine which phrase applies to the series $\sum_{n=2}^{\infty} \frac{\cos(n\pi)}{n+1}$

(a) *has an infinite radius of convergence*

(b) *diverges*

(c) *is not alternating*

(d) *converges conditionally*

(e) *converges absolutely*

9. Use power series to calculate $\lim_{x \rightarrow 0} \frac{x^4 - x \sin(x^3)}{\exp(x^{10}) - 1}$

(a) $1/3$

(b) $1/2$

(c) 0

(d) $2/5$

(e) $1/6$

10. Evaluate the indefinite integral $\int (1 + x^3)^{-2} dx$ using power series. [Hint: Find a power series for $(1 + u)^{-2}$ and substitute $u = x^3$.]

(a) $C - 2x^3 + 3x^6 - 4x^9 + \dots$

(b) $C + \frac{1}{4}x^4 - \frac{1}{7}x^7 + \frac{1}{10}x^{10} - \dots$

(c) $C - x + \frac{1}{2}x^2 - \frac{1}{3}x^3 + \frac{1}{4}x^4 - \dots$

(d) $C + x - \frac{2}{4}x^4 + \frac{3}{7}x^7 - \frac{4}{10}x^{10} + \dots$

(e) $C + x - x^2 + x^3 - x^4 + \dots$

11. Determine which of the following approximates $\sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{n^3}$ using the least number of terms and having an error less than 0.05.

(a) $1 - \frac{1}{8} + \frac{1}{27} - \frac{1}{64} + \frac{1}{125}$

(b) $1 - \frac{1}{8}$

(c) $1 - \frac{1}{8} + \frac{1}{27} - \frac{1}{64}$

(d) 1

(e) $1 - \frac{1}{8} + \frac{1}{27}$

12. Use *Taylor's Inequality* to estimate the maximum error of approximating $f(x) = xe^x$ by $T_2(x) = x + x^2$ on the interval $-1 \leq x \leq 1$.

(a) $4e/3$

(b) $e/3$

(c) $3/e$

(d) $4/e$

(e) $4e$