

Expand the function in a power series with center $c = 0$ and determine the set of x for which the expansion is valid.

1. $f(x) = \frac{1}{1-3x}$

2. $f(x) = \frac{1}{1+3x}$

3. $f(x) = \frac{1}{3-x}$

4. $f(x) = \frac{1}{4+3x}$

5. $f(x) = \frac{1}{1+x^9}$

6. $f(x) = \frac{1}{5-x^2}$

7. $f(x) = \frac{1}{1+3x^7}$

Concept Review: Use the ratio test to prove absolute convergence or divergence for each series.

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

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

10. $\sum_{n=1}^{\infty} \frac{e^n}{n!}$

11. $\sum_{n=1}^{\infty} \frac{n!}{n^4}$

Review:

R1. $\int_{-2}^2 3e^{-x} dx$

- a. $-3e^{-2}$
 b. $-3e^2$
 c. $6(1 - e^{-2})$
 d. $3(e^2 - e^{-2})$
 e. $3(e^{-2} - e^2)$

R3. Find $\frac{dy}{dx}$ if $\tan y = (x - y)^2$

- a. $\frac{dy}{dx} = \frac{2(x - y)}{\sec^2 y + 2(x - y)}$
 b. $\frac{dy}{dx} = \frac{2(x - y)}{\sec^2 y}$
 c. $\frac{dy}{dx} = \frac{\sec^2 y - 2(x - y)}{-2(x - y)}$
 d. $\frac{dy}{dx} = \frac{1}{1 + \sec^2 y}$
 e. $\frac{dy}{dx} = 1 + \sec^2 y$

R2. If $f(x) = x^3 + 3x^2 + cx + 4$ has a horizontal tangent and a point of inflection at the same value of x , what is the value of c ?

- a. 0
 b. 1
 c. -1
 d. -3
 e. 3

R4. Find $\frac{dy}{dx}$ if $3^{(4-x^2)}$

- a. $\frac{dy}{dx} = (\ln 3)3^{(4-x^2)}$
 b. $\frac{dy}{dx} = -2x(\ln 3)3^{(4-x^2)}$
 c. $\frac{dy}{dx} = -2x(4 - x^2)\ln(3)$
 d. $\frac{dy}{dx} = -2x3^{(4-x^2)}$
 e. $\frac{dy}{dx} = (4 - x^2)3^{(4-x^2)}$

Answers:

1. $\sum_{n=0}^{\infty} (3x)^n \left(-\frac{1}{3}, \frac{1}{3}\right)$

2. $\sum_{n=0}^{\infty} (-1)^n x^n \left(-\frac{1}{3}, \frac{1}{3}\right)$

3. $\sum_{n=0}^{\infty} \frac{x^n}{3^{n+1}} (-3, 3)$

4. $\sum_{n=0}^{\infty} \frac{(-1)^n (3x)^n}{4^{n+1}} \left(-\frac{4}{3}, \frac{4}{3}\right)$

5. $\sum_{n=0}^{\infty} (-1)^n x^{9n} (-1, 1)$

6. $\sum_{n=0}^{\infty} \frac{x^{2n}}{5^{n+1}} (-\sqrt{5}, \sqrt{5})$

7. $\sum_{n=0}^{\infty} (-1)^n 3^n x^{7n} \left(\sqrt[7]{-\frac{1}{3}}, \sqrt[7]{\frac{1}{3}}\right)$

8. Diverges Ratio

9. Diverges Limit Comparison

10. Converges Ratio

11. Diverges Ratio

R1. D

R2. E

R3. A

R4. B