

## Radius and Interval of Convergence

## Day 2 Power Series

Find the radius of convergence and the interval of convergence of the series.

1. 
$$\sum_{n=1}^{\infty} (-1)^n n x^n$$

2. 
$$\sum_{n=1}^{\infty} \frac{(-1)^n x^n}{\sqrt[3]{n}}$$

3. 
$$\sum_{n=1}^{\infty} \frac{x^n}{2n-1}$$

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

5. 
$$\sum_{n=1}^{\infty} n^n x^n$$

6. 
$$\sum_{n=1}^{\infty} (-1)^n \frac{n^2 x^n}{2^n}$$

7. 
$$\sum_{n=1}^{\infty} \frac{(-3)^n}{n\sqrt{n}} x^n$$

8. 
$$\sum_{n=1}^{\infty} (-1)^n \frac{x^n}{4^n \ln n}$$

9.  $\sum_{n=1}^{\infty} \frac{3^n (x+4)^n}{\sqrt{n}}$

10.  $\sum_{n=1}^{\infty} \frac{(x-2)^n}{n^2 + 1}$

11.  $\sum_{n=1}^{\infty} \frac{(x-2)^n}{n^n}$

12.  $\sum_{n=1}^{\infty} n!(2x-1)^n$

**Review:**

R1. Which of the following series are convergent?

I.  $12 - 8 + \frac{16}{3} - \frac{32}{9} + \dots$

II.  $5 + \frac{5\sqrt{2}}{2} + \frac{5\sqrt{3}}{3} + \frac{5}{2} + \sqrt{5} + \frac{5\sqrt{6}}{6} + \dots$

III.  $8 + 20 + 50 + 125 + \dots$

- a. I only      b. II only      c. III only  
 d. I & II      e. II & III

R2. The  $\lim_{h \rightarrow 0} \frac{\ln(x-3+h) - \ln(x-3)}{h}$

- a.  $\ln(x+3)$       b.  $\ln(x-3)$       c.  $\frac{1}{\ln(x-3)}$   
 d.  $\frac{1}{x+3}$       e.  $\frac{1}{x-3}$

**Answers:**

- |   |  |  |
|---|--|--|
| 1. $R=1$ I.O.C = $(-1,1)$   | 2. $R=1$ I.O.C = $(-1,1]$                  | 3. $R=1$ I.O.C = $[-1,1)$  |
| 4. $R=\infty$ I.O.C = $(-\infty, \infty)$                           | 5. $R=0$ I.O.C = $\{0\}$                   | 6. $R=2$ I.O.C = $(-2,2)$  |
| 7. $R=\frac{1}{3}$ I.O.C = $\left[-\frac{1}{3}, \frac{1}{3}\right]$ | 8. $R=4$ I.O.C = $(-4,4]$                  | 9. $R=\frac{1}{3}$ I.O.C = $\left[-\frac{13}{3}, -\frac{11}{3}\right)$ |
| 10. $R=1$ I.O.C = $[1,3]$   | 11. $R=\infty$ I.O.C = $(-\infty, \infty)$ | 12. $R=0$ I.O.C = $\left\{\frac{1}{2}\right\}$                         |

R1. A

R2. E