

Name:

Section: 5 6 9 10

For the following power series find the radius of convergence and the interval of convergence.

$$\sum_{n=1}^{\infty} \frac{(x-1)^n}{5^n n}$$

$$\sqrt[n]{|a_n|} = \sqrt[n]{\frac{|x-1|^n}{5^n \cdot n}} = \frac{|x-1|}{5 \cdot \sqrt[n]{n}} \rightarrow \frac{|x-1|}{5}$$

$$\frac{|x-1|}{5} < 1 \iff |x-1| < 5 \iff -5 < x-1 < 5 \iff -4 < x < 6$$

radius

$$x = -4: \sum_{n=1}^{\infty} \frac{(-4-1)^n}{5^n \cdot n} = \sum_{n=1}^{\infty} \frac{(-1)^n}{n} \text{ converges by AST.}$$

$$x = 6: \sum_{n=1}^{\infty} \frac{(6-1)^n}{5^n \cdot n} = \sum_{n=1}^{\infty} \frac{1}{n} \text{ diverges (p-series } p=1)$$

$$\text{I.O.C: } [-4, 6)$$

$$\text{R.O.C: } R = 5$$