

Power Series Practice

Write the given function as a Power Series and determine the Interval of Convergence.

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

$$a=3$$
$$r=x$$

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

interval of convergence:

$$|x| < 1$$

$$-1 < x < 1$$

2. $g(x) = \frac{1}{1+2x} = \frac{1}{1-(-2x)} = \sum_{n=0}^{\infty} 1(-2x)^n$

$$a=1$$
$$r=-2x$$

$$g(x) = \sum_{n=0}^{\infty} (-1)^n (2x)^n$$

interval of convergence:

$$|-2x| < 1$$

$$2|x| < 1$$

$$|x| < \frac{1}{2}$$

$$-\frac{1}{2} < x < \frac{1}{2}$$

3. $h(x) = \frac{1}{2-6x} = \frac{1}{2(1-3x)} = \frac{1/2}{1-3x}$

$$a = \frac{1}{2}$$
$$r = 3x$$

$$h(x) = \sum_{n=0}^{\infty} \frac{1}{2} (3x)^n$$

interval of convergence:

$$|3x| < 1$$

$$|x| < \frac{1}{3}$$

$$-\frac{1}{3} < x < \frac{1}{3}$$

4. $p(x) = \frac{x}{x^2+1} = \frac{x}{1+x^2} = \frac{x}{1-(-x^2)}$

$$a=x$$
$$r=-x^2$$

$$= \sum_{n=0}^{\infty} x(-x^2)^n$$

$$= \sum_{n=0}^{\infty} x \cdot (-1)^n x^{2n}$$

$$p(x) = \sum_{n=0}^{\infty} (-1)^n x^{2n+1}$$

interval of convergence:

$$|-x^2| < 1$$

$$|x^2| < 1$$

$$\sqrt{x^2} < \sqrt{1}$$

$$|x| < 1$$

$$-1 < x < 1$$