$f(x) = \frac{a}{1-r}$ Find the Sum Formula

$(x+1)(x+1)$ $f(x) = \frac{9}{9-(x+1)^2}$ $f(x) = \frac{9}{9-(x^2+2x+1)}$ $\boxed{f(x) = \frac{9}{-x^2-2x+8}}$	Find the interval of Convergence and the function that represents the series 24) $\sum_{n=0}^{\infty} \frac{(x+1)^{2n}}{9^n} =$ $r = \frac{(x+1)^2}{9}$ $\boxed{f(x) = \frac{1}{1-\frac{(x+1)^2}{9}}}$ $-1 < \frac{(x+1)^2}{9} < 1$ $-9 < (x+1)^2 < 9$ $(x+1)^2 < 9$ $x+1 < 3 \quad x+1 > -3$ $x < 2 \quad x > -4$ $\boxed{-4 < x < 2}$ 28) $\sum_{n=0}^{\infty} \left(\frac{\sin x}{2}\right)^n =$ $r = \frac{\sin x}{2}$ $f(x) = \frac{1}{1-\frac{\sin x}{2}}$ $-1 < \frac{\sin x}{2} < 1$ $-2 < \sin x < 2$ I.O.C $-\infty < x < \infty$ $(-\infty, \infty)$ $\{x \in \mathbb{R}\}$ All real #'s

What you'll Learn About
Testing Endpoints for Convergece

Find the Interval of Convergence.

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

$$\lim_{n\to\infty}\left|\frac{\left(\frac{2}{3}\right)^{n+1}(x-1)^{n+1}}{\left(\frac{2}{3}\right)^n(x-1)^n}\right| = \left|\frac{2}{3}(x-1)\right| < 1$$

$r = \frac{2}{3}(x-1)$

$\boxed{-1 < \frac{2}{3}(x-1) < 1}$ ✓

$-\frac{3}{2} < x-1 < \frac{3}{2}$

$\boxed{-\frac{1}{2} < x < \frac{5}{2}}$

$x = 5/2$

$\sum_{n=0}^{\infty}\left(\frac{2}{3}\right)^n\left(\frac{5}{2}-1\right)^n$

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

$\lim_{n\to\infty} 1 = 1 \neq 0$

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

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

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

$\sum_{n=0}^{\infty}(-1)^n \to \lim_{n\to\infty}\left|(-1)^n\right| \neq 0$ Diverges

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

$$\lim_{n\to\infty}\left|\frac{(-1)^{n+1}(3x-1)^{n+1}}{(n+1)^2}\cdot\frac{n^2}{(-1)^n(3x-1)^n}\right| = \lim_{n\to\infty}\left|\frac{(3x-1)n^2}{(n+1)^2}\right| = |3x-1| < 1$$

$-1 < 3x-1 < 1$

$0 < 3x < 2$

$\boxed{0 \leq x \leq \frac{2}{3}}$

I.O.C

$x = \frac{2}{3}$

$\sum_{n=0}^{\infty}\frac{(-1)^n}{n^2}$ i) $\lim_{n\to\infty}\left|\frac{(-1)^n}{n^2}\right| = 0$ ii) $\left|\frac{(-1)^{n+1}}{(n+1)^2}\right| < \left|\frac{(-1)^n}{n^2}\right|$ ~~conditional~~

$\sum_{n=0}^{\infty}\frac{1}{n^2}$ $p=2>1$ converges Absolute

$x = 0$

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

$\sum_{n=0}^{\infty}\frac{1}{n^2}$ $p=2>1$ converges

$\lim_{n\to\infty}\left|\frac{1}{(n+1)^2}\cdot\frac{n^2}{1}\right| = 1$

Interval of Abs Convergence
$0 < x \leq \frac{2}{3}$

	9) $\sum_{n=0}^{\infty} \frac{x^n}{\sqrt{n}} =$ $x=-1$ conditional convergence $\lim_{n\to\infty} \left\| \frac{x^{n+1}}{\sqrt{n+1}} \cdot \frac{\sqrt{n}}{x^n} \right\| = \|x\| < 1$ $\boxed{-1 \leq x < 1}$
i) $\lim_{n\to\infty} \left\| \frac{(-1)^n}{\sqrt{n}} \right\| = 0$ ii) $\left\| \frac{(-1)^{n+1}}{\sqrt{n+1}} \right\| \leq \left\| \frac{(-1)^n}{\sqrt{n}} \right\|$	$x=-1$ $\sum_{n=0}^{\infty} \frac{(-1)^n}{\sqrt{n}}$ Absolute? NO $x=1$ $\sum_{n=0}^{\infty} \frac{1}{\sqrt{n}}$ $p=\frac{1}{2} \leq 1$ diverge
	13) $\sum_{n=0}^{\infty} \frac{n!}{2^n} x^{2n} =$ $\lim_{n\to\infty} \left\| \frac{(n+1)!\, x^{2n+2}}{2^{n+1}} \cdot \frac{2^n}{n!\, x^{2n}} \right\| = \lim_{n\to\infty} \left\| \frac{(n+1)\, x^2}{2} \right\| = \infty > 1$ diverges except at the center $x=0$
	1) $\sum_{n=0}^{\infty} \frac{(-x)^n}{n!} =$ converges always $\lim_{n\to\infty} \left\| \frac{(-x)^{n+1}}{(n+1)!} \cdot \frac{n!}{(-x)^n} \right\| = \lim_{n\to\infty} \left\| \frac{x}{n+1} \right\| = 0 < 1$ $-\infty < x < \infty$