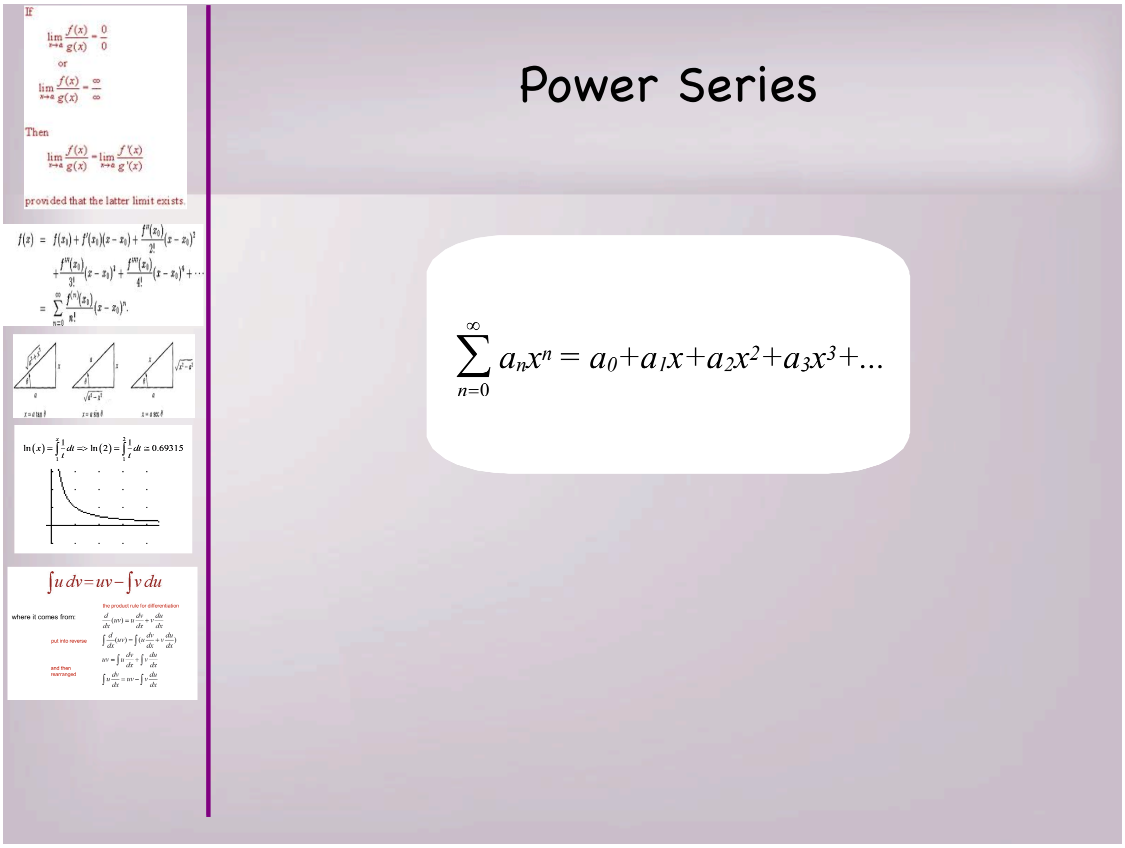

<u>Power Series</u>

Consider a series of functions instead of constants.

<u>Power Series in x</u> $\sum_{n=0}^{\infty} a_n x^n = a_0 + a_1 x + a_2 x^2 + a_3 x^3 + \ldots$ $\quad a_0 = a_0 x^0$

EX 1 When does this power series converge, i.e., for what x-values?

$$\sum_{n=0}^{\infty} a x^n \qquad \begin{Bmatrix} a \in \Re \\ a \neq 0 \end{Bmatrix}$$

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Theorem

The convergence set for a power series $\sum_{n=0}^{\infty} a_n x^n$ is always an interval of one of these three types.

1) The single point at $x = 0$.
2) An interval, $(-R,R)$, $[-R,R]$, $[-R,R)$, or $(-R,R]$
3) $(-\infty, \infty)$

The radius of convergence is 0, R, or ∞, respectively.

EX 2 Find the convergence set for $1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \frac{x^6}{6!} + \frac{x^8}{8!} + \ldots$.

EX 3 Find the convergence set for $1+x+\frac{x^2}{\sqrt{2}}+\frac{x^3}{\sqrt{3}}+\frac{x^4}{\sqrt{4}}+\ldots$.

<u>Power Series in *(x-c)*</u>

$$\sum_{n=0}^{\infty} a_n(x-c)^n = a_0 + a_1(x-c) + a_2(x-c)^2 + a_3(x-c)^3 + \ldots$$

Convergence set :

1) The single point at $x = c$
2) An interval, $(c-R,\ c+R)$ (may include endpoints)
3) $(-\infty,\ \infty)$

EX 4 Find the convergence set for $\frac{x-3}{2}+\frac{(x-3)^2}{2^2}+\frac{(x-3)^3}{2^3}+\ldots$.