COLLEGE
Tanta Engineering

إعدادي 2020

الجبر

المحاضرة الثالثة - نظرية ذات الحدين

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Binomial theorem

$$(a+b)^n = a^n + C_1^n a^{n-1} b^1 + C_2^n a^{n-n} b^2 + C_3^n a^{n-3} b^3 + \dots + C_n^n a^1 b^n$$

n = integer #

$$C_r^n = \binom{n}{r} = \frac{n!}{r!\,(n-r)!}$$

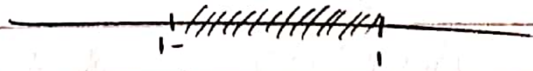
$$(1+x)^n = 1 + nx + \frac{n(n-1)}{2!}x^2 + \frac{n(n-1)(n-2)}{3!}x^2 + \dots, \quad |x|<1 \quad n \neq \text{integer}\ \#$$

$$f(x) = (1+x)^{-3}, \quad x \ll, \quad x \gg$$

$x \ll$ (very small) $\quad f(x) = (1+x)^{-3} = 1 + (-3)(x) + \frac{(-3)(-4)}{2!} + \frac{(-3)(-4)(-5)}{3!} + \dots$

$$|x| < 1$$

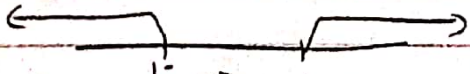
$$-1 < x < +1$$



$x \ll$ (very large) $\quad f(x) = x^{-3}\left(1+\frac{1}{x}\right)^{-3} = x^{-3}\left[1 + (-3)\left(\frac{1}{x}\right) + \frac{-3x-4}{3!}\right.$

$$\frac{1}{x} < 1 \Rightarrow |x| > 1$$

$$-1 > x > 1$$



$$]-\infty, -1[\ \cup\ ]1, \infty[$$

find and approximate a value for $f(x) = \dfrac{\sqrt{1+2x}}{\sqrt[3]{1+3x}}$
neglecting x^3 and ~~other~~ the following terms

$$f(x) = (1+2x)^{\frac{1}{2}} \cdot (1+3x)^{-\frac{1}{3}}$$

$$= \left(1 + \frac{1}{2} \times 2x + \frac{\frac{1}{2} \times -\frac{1}{2}}{2!} \times 4x^2\right) \cdot \left(1 + -\frac{1}{3} \times 3x + \frac{-\frac{1}{3} \times \frac{-4}{3}}{2!} \times 9x^2\right)$$

$$\simeq 1 + \frac{x^2}{2}$$

كملها

$$\sqrt[3]{\frac{41}{25}} \quad , \quad \frac{\sqrt{2}}{\sqrt[3]{3}}$$

$$\sqrt[3]{\frac{41}{25} \times \frac{5}{5}} = \frac{1}{5}\sqrt[3]{205} = \frac{1}{5}\sqrt[3]{216-11} = \frac{1}{5}\sqrt[3]{6^3-11} = \frac{6}{5} \times \left(1 - \frac{11}{216}\right)^{\frac{1}{3}}$$

خطأ

$$\frac{\sqrt{2}}{\sqrt[3]{3}} = \left(\left(\frac{\sqrt{2}}{\sqrt[3]{3}}\right)^6\right)^{1/6}$$

أرقام البسط بتزيد ∴ n سالبة
الاشارة بتتذبذب و n سالبة ∴ x موجبة
لو الأرقام بتزيد والفرق بين الأرقام مش واحد يبقى الـ n كسر مقامه هو الفرق

Ex 13:
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$S = 1 + \frac{1}{3} + \frac{1.3}{3.6} + \frac{1.3.5}{3.6.9}$

$1 + \left(\frac{-1}{2}\right)\left(\frac{-2}{3}\right) + \frac{\left(\frac{-1}{2}\right)\left(\frac{-3}{2}\right)}{1.2}\left(\frac{-2}{3}\right)^2 + \frac{\left(\frac{-1}{2}\right)\left(\frac{-3}{2}\right)\left(\frac{-5}{2}\right)}{1.2.3}\left(\frac{-2}{3}\right)^3 + \dots$

$n = -\frac{1}{2} \qquad x = \frac{-2}{3}$

ح- الأرقام يتزايد ∴ الـ n سالبة
ب- الاشارات كلها موجبة ∴ x سالبة
ج- قسمت على ثابت التتابع وضربت فيه
أ- أخذنا مشترك المقام

$(1+x)^n = \left(1 - \frac{2}{3}\right)^{-\frac{1}{2}} = \sqrt{3}$

$S = \frac{11}{6} + \frac{5.7}{6.12} + \frac{5.7.9}{6.12.18}$

$S = 1 + \left(-\frac{5}{2}\right)\left(\frac{-2}{6}\right) + \left(\frac{\frac{-5}{2} \cdot \frac{-7}{2}}{1.2}\right)\left(\frac{-2}{6}\right)^2 + \left(\frac{\left(\frac{-5}{2}\right)\left(\frac{-7}{2}\right)\left(\frac{-9}{2}\right)}{1.2.3}\right)\left(\frac{-2}{6}\right)^3 + \dots$

$n = -\frac{5}{2}$
$x = \frac{-2}{6}$

$S = \left(1 - \frac{1}{3}\right)^{-\frac{5}{2}}$

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$$\left.\begin{aligned}
(1-x)^{-1} &= 1+x+x^2+x^3+\dots+x^r \\
(1+x)^{-1} &= 1-x+x^2-x^3+\dots+(-1)^r(x)^r \\
(1-x)^{-2} &= 1+2x+3x^2+4x^3+\dots+(r+1)x^r \\
(1+x)^{-2} &= 1-2x+3x^2-4x^3+\dots+(-1)^r(r+1)x^r
\end{aligned}\right\} |x|<1$$

the coofetient of x^n in $f(x)=\frac{1-x}{1+x+x^2}$

$$\frac{1-x}{1+x+x^2} \times \frac{1-x}{1-x} = \frac{(1-x)^2}{(1-x^3)} = (1-2x+x^2)(1-x^3)^{-1}$$

$$=(1-2x+x^2)(1+x^3+x^6+x^9+x^{3r})$$ اكتب الحد العام بس

$C.O.\ x^{3n} = 1$

$C.O\ x^{3n+1} = -2$

$C.O\ x^{3n+2}\quad 1$

$$f(x)=\frac{1-x}{(1+x-2x^2)}$$

Partial Fraction

$$=\frac{1-x}{(1-x)(2x+1)} = \frac{A}{1+2x}+\frac{B}{1-x}$$