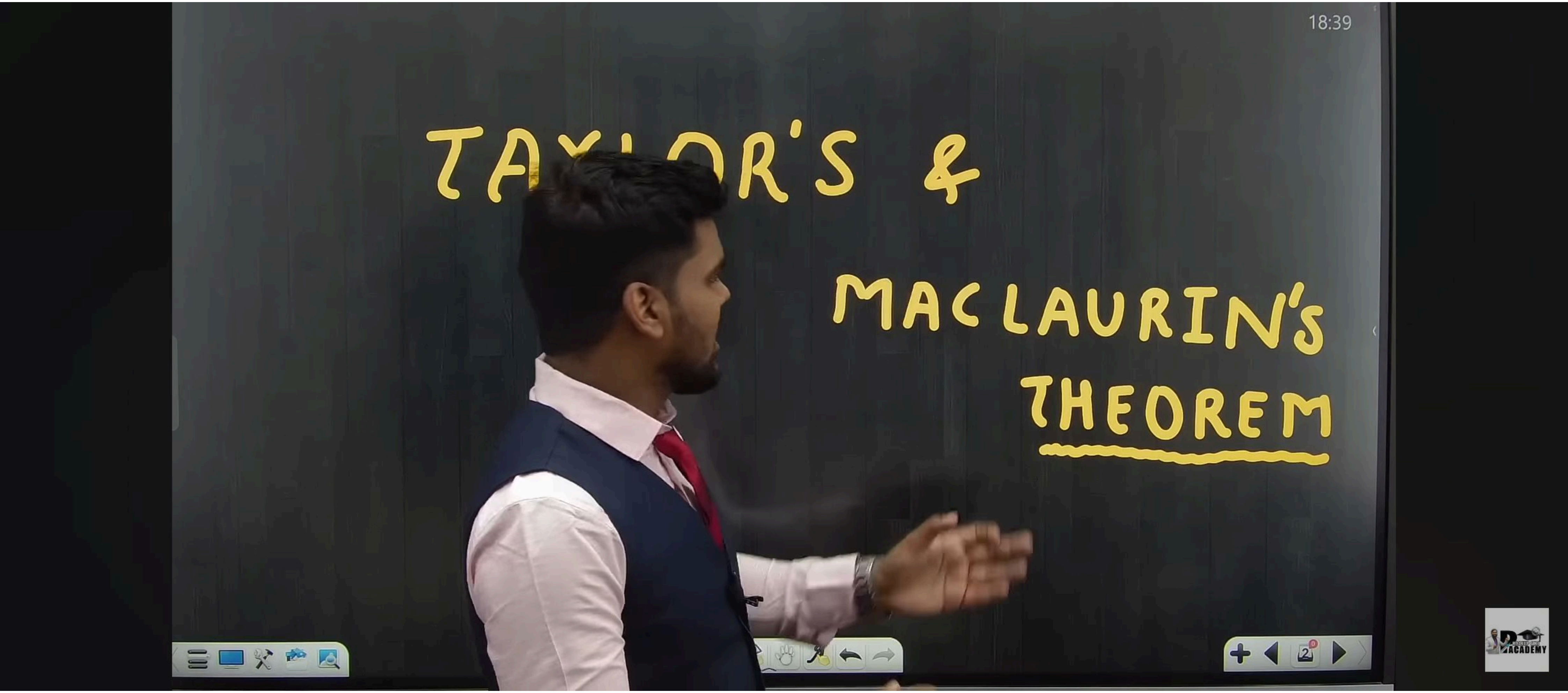
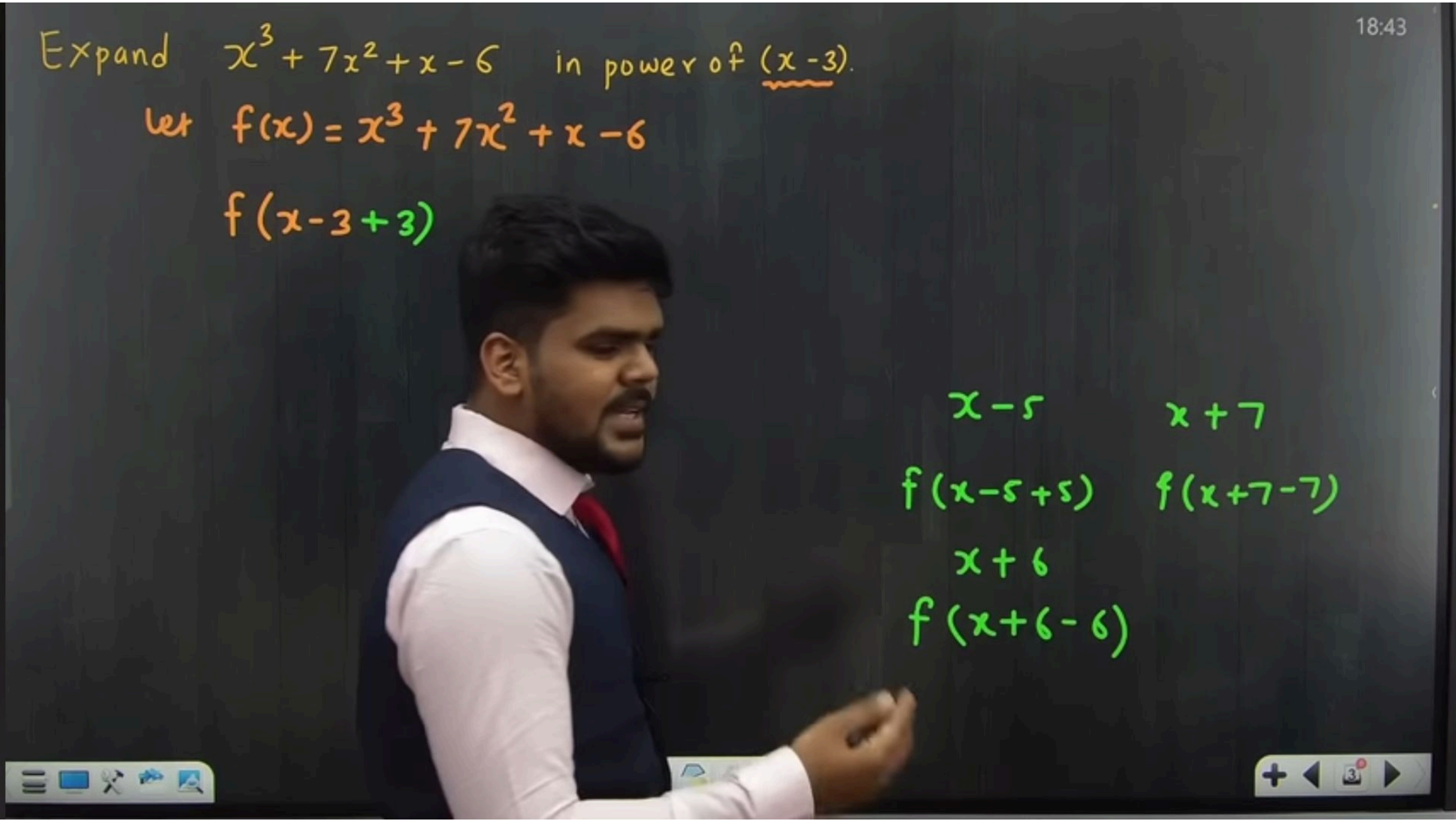

18:39
&
MACLAURIN'S
THEOREM
ACADEMY

Expand x^3+7x^2+x-6 in power of $(x-3)$.

$$f(x+h) = f(h) + x f'(h) + \frac{x^2 f''(h)}{2!} + \frac{x^3 f'''(h)}{3!} + \cdots$$


18:43
Expand x^3+7x^2+x-6 in power of $(x-3)$.
let $f(x)=x^3+7x^2+x-6$
$f(x-3+3)$
$x-5$
$x+7$
$f(x-5+5)$
$f(x+7-7)$
$x+6$
$f(x+6-6)$

18:45

Expand $x^3 + 7x^2 + x - 6$ in power of $(x-3)$.

let $f(x) = x^3 + 7x^2 + x - 6$

$3! = 3 \times 2 \times 1$

$2! = 2 \times 1$

$$f(\underbrace{x-3}_{x}\underbrace{+3}_{h}) =$$

$$f(x+h) = f(h) + x f'(h) + \frac{x^2 f''(h)}{2!} + \frac{x^3 f'''(h)}{3!} + \dots\dots$$

$$f(\underbrace{x-3}_{x}\ \underbrace{+3}_{h}) =$$

$$2! = 2\times 1$$

18:46

$$f(x+h) = f(h) + x f'(h) + \frac{x^2 f''(h)}{2!} + \frac{x^3 f'''(h)}{3!} + \ldots\ldots$$

$$f(x-3+3) = f(3) + (x-3) f'(3) + \frac{(x-3)^2 f''(3)}{2!} + \frac{(x-3)^3 f'''(3)}{3!} + \ldots\ldots \quad -\text{(I)}$$

let $f(x) = x^3 + 7x^2 + x - 6$

$f(3) = 3^3 + 7(3)^2 + 3 - 6 = 87$

18:52

$f(\underbrace{x-3}_{x}\ \underbrace{+3}_{h}) =$

$f'(x) = 3x^2 + 14x + 1$

$f'(3) = 3(3)^2 + 14(3) + 1 = 70$

$f''(x) = 6x + 14$

$f''(3) = 6(3) + 14 = 32$

$f'''(x) = 6$

$f'''(3) = 6$

$(x+h) = f(h) + x f'(h) + \frac{x^2 f''(h)}{2!} + \frac{x^3 f'''(h)}{3!} + \ldots\ldots$

$-3+3) = f(3) + (x-3) f'(3) + \frac{(x-3)^2}{2!} f''(3) + \frac{(x-3)^3 f'''(3)}{3!} + \ldots$ — (I)

Let $f(x) = x^3 + 7x^2 + x - 6$

$f(3) = 3^3 + 7(3)^2 + 3 - 6 = 87$

$f'(x) = 3x^2 + 14x + 1$ $\quad f'(3) = 3(3)^2 + 14(3) + 1 = 70$

$f(\underbrace{x-3}_{x}\ \underbrace{+3}_{h}) =$

$f''(x) = 6x + 14$ $\quad f''(3) = 6(3) + 14 = 32$

$f'''(x) = 6$ $\quad f'''(3) = 6$

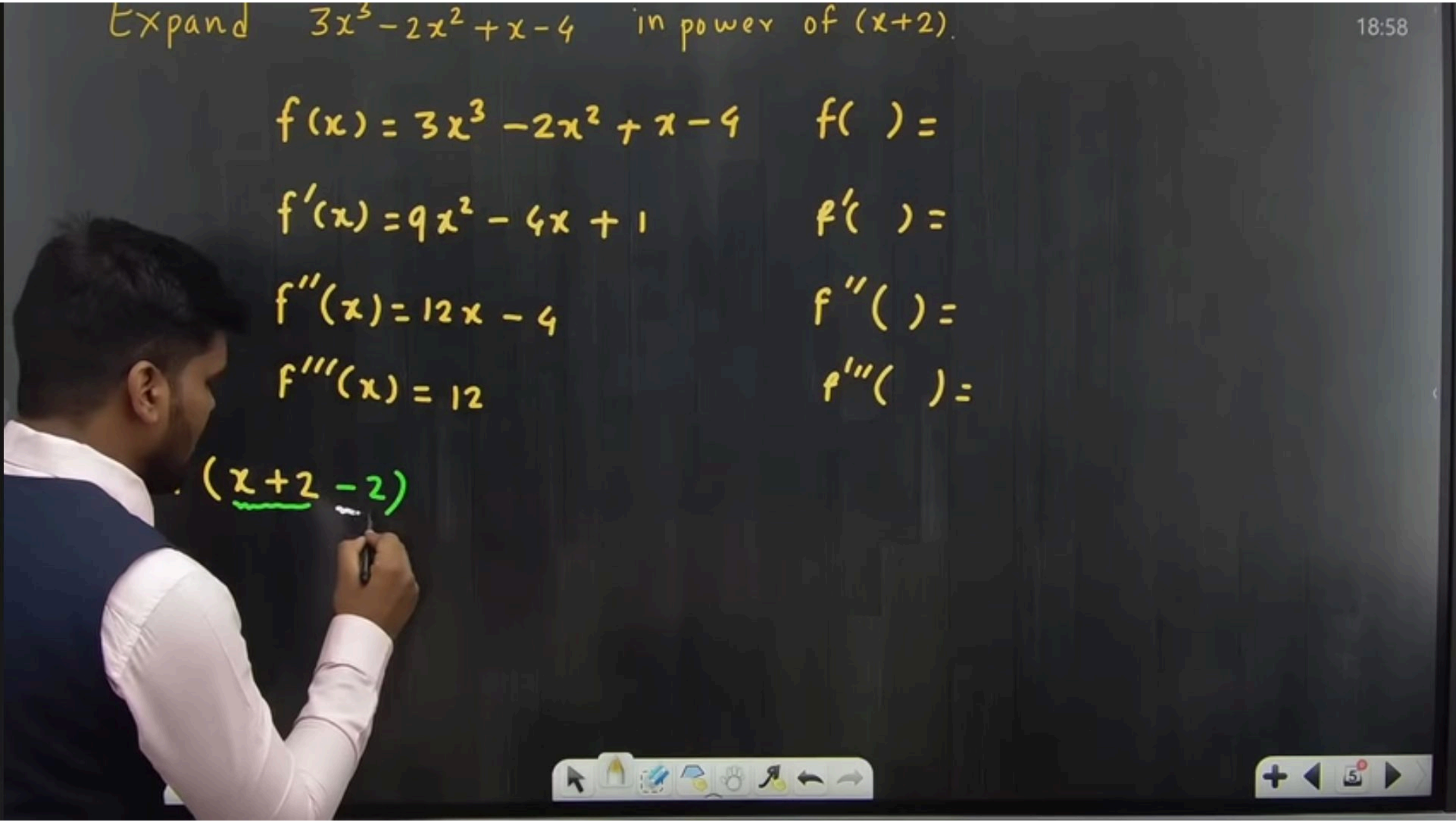
$\ldots h) = f(h) + x f'(h) + \frac{x^2 f''(h)}{2!} + \frac{x^3 f'''(h)}{3!} + \ldots\ldots$

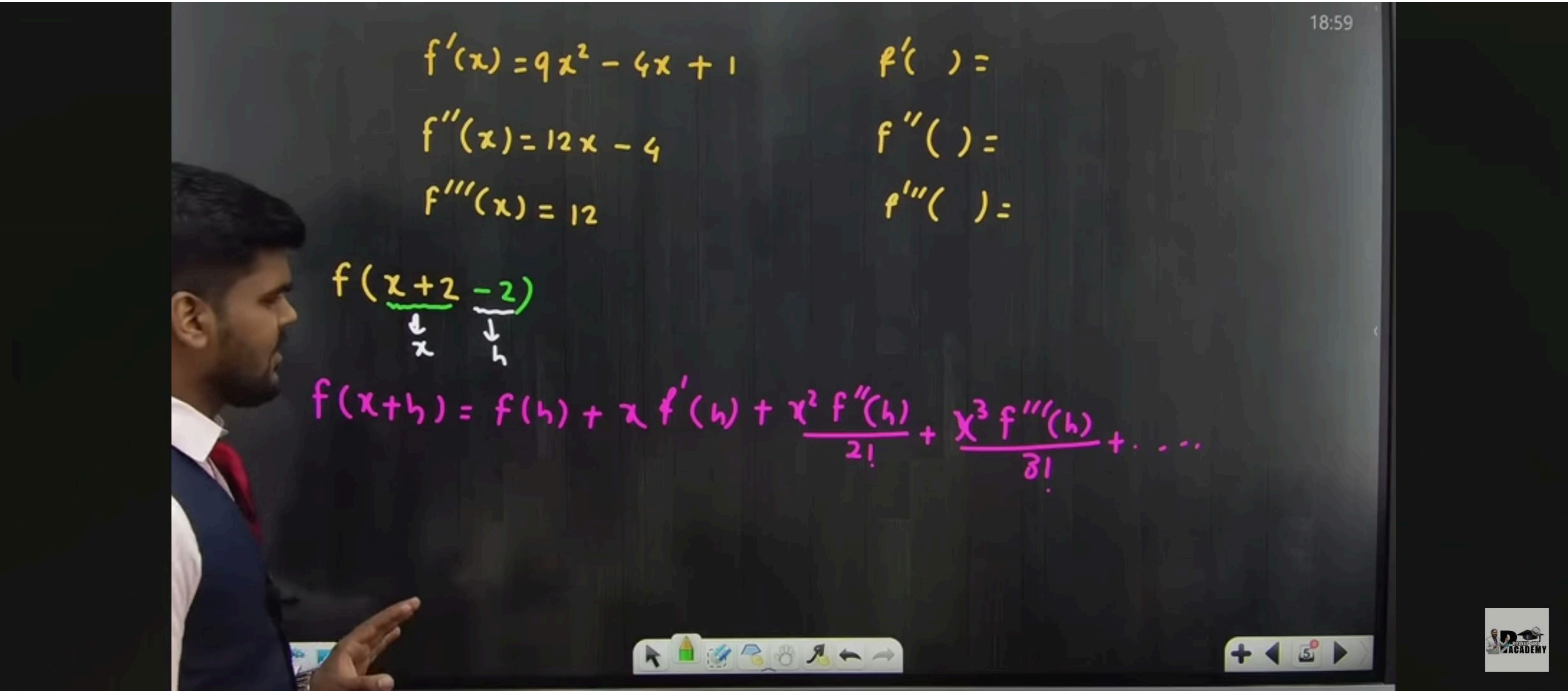
$\ldots +3) = f(3) + (x-3) f'(3) + \frac{(x-3)^2}{2!} f''(3) + \frac{(x-3)^3 f'''(3)}{3!} + \ldots \quad$ — (I)

$= 87 + (x-3)70 + \frac{(x-3)^2}{\cancel{2}} \times \overset{16}{\cancel{32}} + \frac{(x-3)^3}{\cancel{6}} \times \cancel{6} + \ldots\ldots$

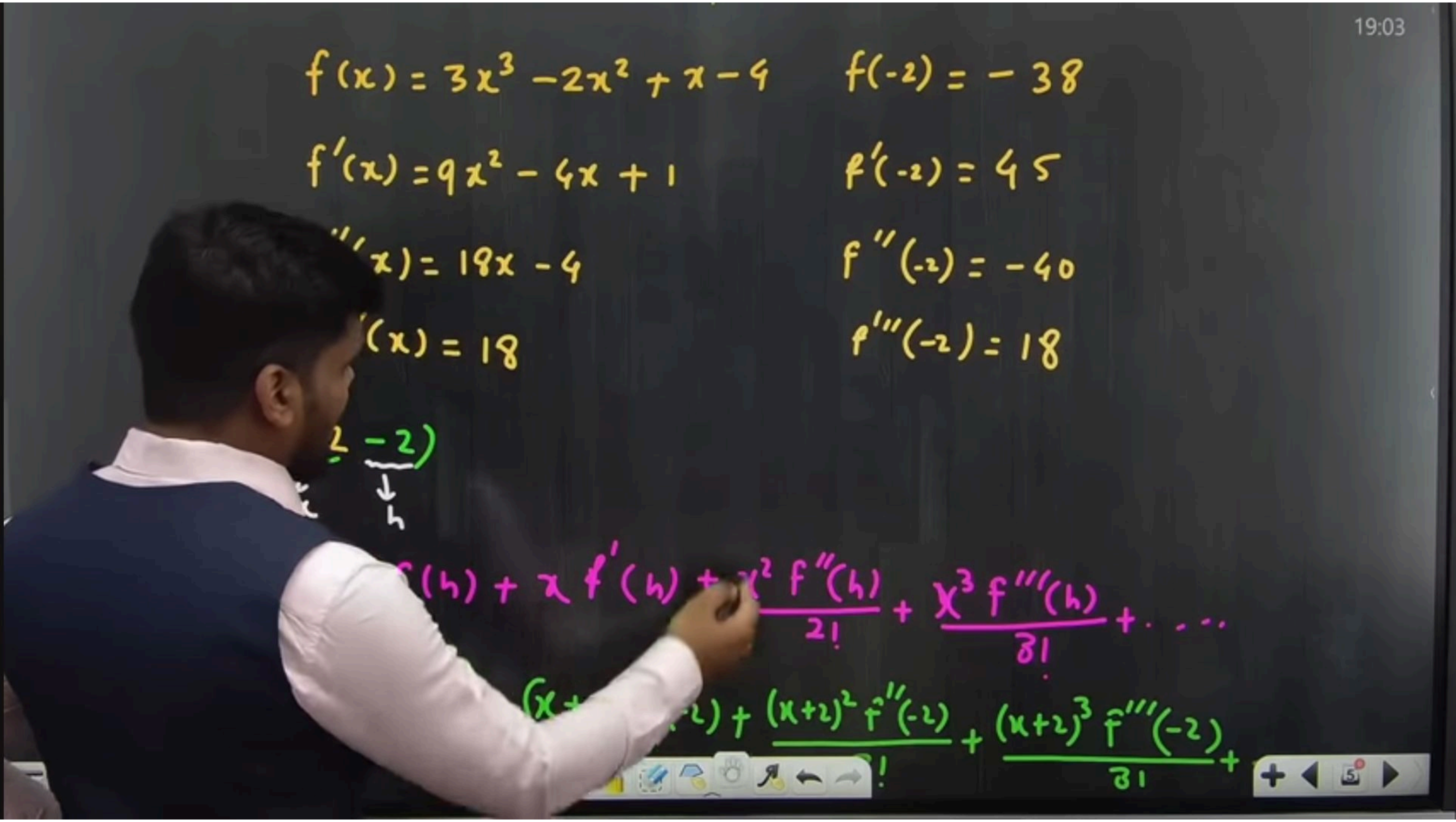
$= 87 + (x-3)70 + 16(x-3)^2 + (x-3)^3 + \ldots\ldots$

Max power of x times differentiate Krna hai


Expand 3x^3-2x^2+x-4 in power of (x+2).
18:58
f(x) = 3x^3 - 2x^2 + x - 4
f( ) =
f'(x) = 9x^2 - 4x + 1
f'( ) =
f''(x) = 12x - 4
f''( ) =
f'''(x) = 12
f'''( ) =
(x+2 - 2)



18:59
f'(x) = 9x^2 - 4x + 1
f''(x) = 12x - 4
f'''(x) = 12
f'( ) =
f''( ) =
f'''( ) =
f(x + 2 - 2)
x
h
f(x+h) = f(h) + x f'(h) + x^2 f''(h)/2! + x^3 f'''(h)/3! + ...
ACADEMY


19:03
$f(x) = 3x^3 - 2x^2 + x - 4$
$f(-2) = -38$
$f'(x) = 9x^2 - 4x + 1$
$f'(-2) = 45$
$(x) = 18x - 4$
$f''(-2) = -40$
$(x) = 18$
$f'''(-2) = 18$
$(h) + x f'(h)$
$\frac{x^3 f'''(h)}{3!} + \dots$
$\frac{(x+2)^2 f''(-2)}{}$
$+ \frac{(x+2)^3 f'''(-2)}{3!} +$

Expand $\log \cos x$ about $\frac{\pi}{3}$ using Taylor's Expansion.

$$f(x) = \log \cos x$$

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

$$\left(x - \frac{\pi}{3}\right)$$

$$f'(x) = \frac{1}{\cos x} \times -\sin x = -\tan x$$

$$f''(x) = -\sec^2 x$$

$$f'''(x) = -2(\sec x)^{2-1} \times \sec x \cdot \tan x.$$

$$f'''(x) = -2 \sec x \cdot \sec x \cdot \tan x$$

$$f'''(x) = -2 \sec^2 x \cdot \tan x.$$

19:07

$$f'(x) = \frac{1}{\cos x} \times -\sin x = -\tan x \qquad \left(x - \frac{\pi}{3}\right)$$

$$f''(x) = -\sec^2 x$$

$$f'''(x) = -2(\sec x)^{2-1} \times \sec x \cdot \tan x.$$

$$f'''(x) = -2 \sec x \cdot \sec x \cdot \tan x$$

$$f'''(x) = -2 \sec^2 x \cdot \tan x.$$

$$f\left(\underbrace{x - \frac{\pi}{3}}_{x} + \underbrace{\frac{\pi}{3}}_{h}\right) = f\left(\frac{\pi}{3}\right) + \left(x - \frac{\pi}{3}\right) f'\left(\frac{\pi}{3}\right)$$

Using Taylor's Theorem express. (Type-II)

$$7 + (x+2) + 3(x+2)^3 + (x+2)^4$$ in ascending power of x.

$$f(x) = 7 +$$

$7 + (x+2) + 3(x+2)^3 + (x+2)^4$ in ascending power of x.

$$f(x) = 7 + x + 3x^3 + x^4$$

$$f'(x) = 1 + 9x^2 + 4x^3$$

$$f''(x) = 18x + 12x^2$$

$$f'''(x) = 18 + 24x$$

$$f^{iv}(x) = 24.$$

Bracket hi expansion hai

19:13

$$f''(x) = 18x + 12x^2$$

$$f'''(x) = 18 + 24x$$

$$f^{iv}(x) = 24.$$

$$f(x+h) = f(h) + x\,f'(h) + \frac{x^2\,f''(h)}{2!} + \frac{x^3\,f'''(h)}{3!} + \frac{x^4 \cdot f^{iv}(h)}{4!} + \dots$$

$$f(\underset{x}{x}+\underset{h}{2}) = f(2) + x \cdot f'(2) + \frac{x^2 \cdot f''(2)}{2!} + \frac{x^3 \cdot f'''(2)}{3!} + \frac{x^4 \cdot f^{iv}(2)}{4!} + \dots$$

ACADEMY

$7+(x+2)+3(x+2)^3+(x+2)^4$ in ascending power of x.

$f(x) = 7 + x + 3x^3 + x^4$ $\qquad f(2) = 49$

$f'(x) = 1 + 9x^2 + 4x^3$ $\qquad f'(2) = 69$

$f''(x)$ ... x^2 $\qquad f''(2) = 84$

$f'''($ ... $4x$ $\qquad f'''(2) = 66$

$f^{iv}($ ... $\qquad f^{iv}(2) = 24$

$\ldots h) + x f'(h) + \frac{x^2 f''(h)}{2!} + \frac{x^3 f'''(h)}{3!} + \frac{x^4 \cdot f^{iv}(h)}{4!} + \ldots$

$\ldots f'(2) + \frac{x^2 \cdot f''(2)}{2!} + \frac{x^3 \cdot f'''(2)}{3!} + \frac{x^4 \cdot f^{iv}(2)}{4!} + \ldots$

Using Taylor's theorem express

$(x-2)^4 - 3(x-2)^3 + 4(x-2)^2 + 5$ in power of x.

Using Taylor's theorem express

$(x-2)^4 - 3(x-2)^3 + 4(x-2)^2 + 5$ in power of x.

$$f(x) = x^4 - 3x^3 + 4x^2 + 5$$

$$f(\underset{x}{x}\ \underset{h}{-2}) =$$

19:20

Type-3

Using Taylor's Theorem to obtain approximate value of the following upto Four decimal places.

$\sqrt{25.15} = ?$

$f(x) = \sqrt{25.15}$

$\sqrt{x+h}$

$1^2 = 1$

$2^2 = 4$

$3^2 = 9$

$4^2 = 16$

$5^2 = 25$

$25 + 0.15$

$9.12 = 9 + 0.12$

$16.05 = 16 + 0.5$

$\sqrt{10}$ $\quad 9$

Four decimal places.

$\sqrt{25.15} = ?$

$f(x) = \sqrt{25.15}$

$f(x+h) = \sqrt{x+h}$

$f(x+h) = \sqrt{25+0.15}$

$\boxed{x = 25}$ $\boxed{h = 0.15}$

$f(x) = \sqrt{x}$

$f'(x) = \frac{1}{2\sqrt{x}} = \frac{1}{2x^{1/2}}$

$f''(x) = \frac{1\left(-\frac{1}{2}\right)}{2\,x^{3/2}} = \frac{-1}{4\,x^{3/2}}$

19:23

19:23

$$\sqrt{25.15} = ?$$

$$f(x) = \sqrt{25.15}$$

$$f(x+h) = \sqrt{x+h}$$

$$f(x+h) = \sqrt{25+0.15}$$

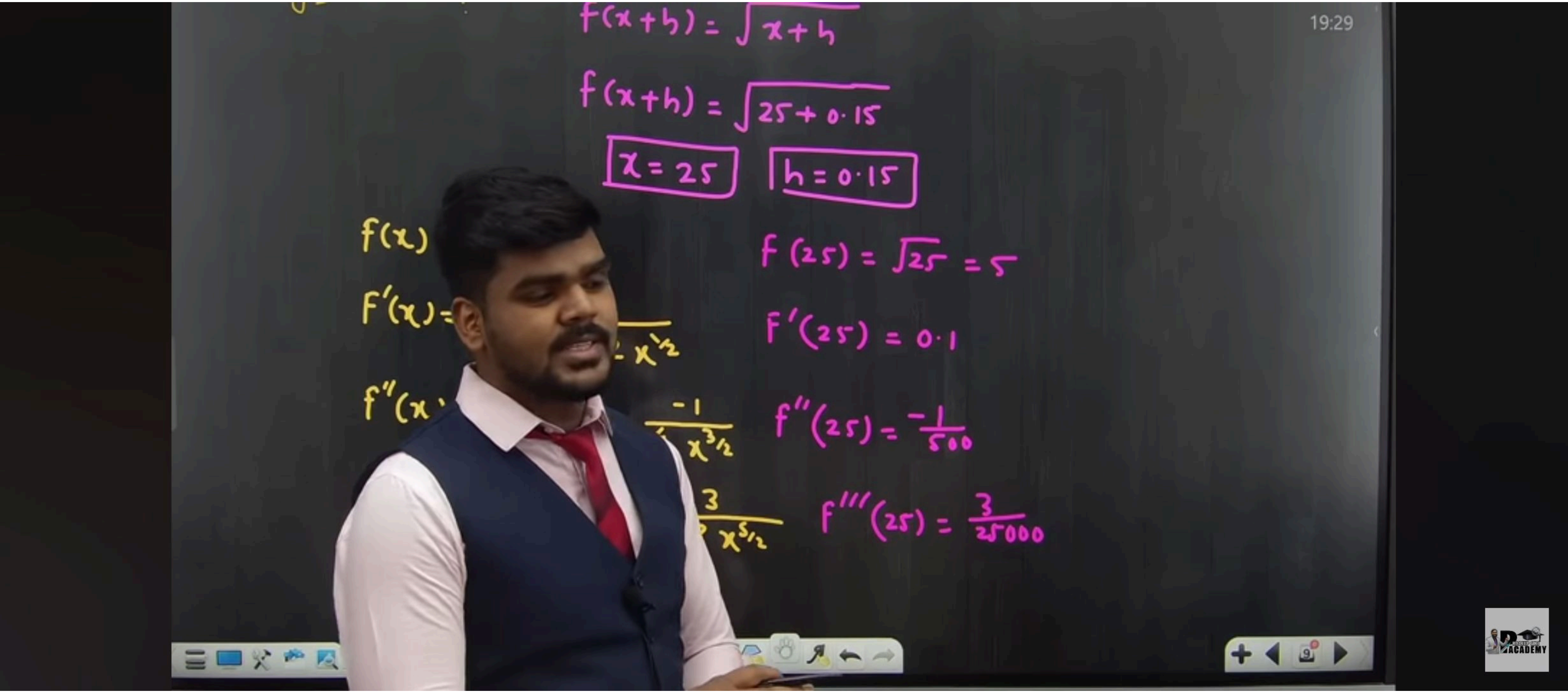
$$\boxed{x = 25} \quad \boxed{h = 0.15}$$

$$f(x) = \sqrt{x}$$

$$f'(x) = \frac{1}{2\sqrt{x}} = \frac{1}{2x^{1/2}}$$

$$f''(x) = \frac{1\left(-\frac{1}{2}\right)}{2x^{3/2}} = \frac{-1}{4x^{3/2}}$$

$$f'''(x) = \frac{-1\left(-\frac{3}{2}\right)}{4x^{5/2}} = \frac{3}{8x^{5/2}}$$


$f(x+h) = \sqrt{x+h}$
$f(x+h) = \sqrt{25+0.15}$
$\boxed{x = 25}$ $\boxed{h = 0.15}$
$f(x)$
$F'(x) =$
$f''(x$
$f(25) = \sqrt{25} = 5$
$F'(25) = 0.1$
$f''(25) = \frac{-1}{500}$
$f'''(25) = \frac{3}{25000}$
19:29
ACADEMY

Interchange x and h in the formula for type 3

19:32

$$f(x) = \sqrt{x} \qquad f(25) = \sqrt{25} = 5$$

$$f'(x) = \frac{1}{2\sqrt{x}} = \frac{1}{2x^{1/2}} \qquad f'(25) = 0.1$$

$$f''(x) = \frac{1\left(-\frac{1}{2}\right)}{2\,x^{3/2}} = \frac{-1}{4\,x^{3/2}} \qquad f''(25) = \frac{-1}{500}$$

$$f'''(x) = \frac{-1\left(-\frac{3}{2}\right)}{4\,x^{5/2}} = \frac{3}{8\,x^{5/2}} \qquad f'''(25) = \frac{3}{25000}$$

$$f(x+h) = f(x) + h\,f'(x) + \frac{h^2\,f''(x)}{2!} + \frac{h^3\,f'''(x)}{3!} + \dots$$

$$= f(25) + 0.15\,f'(25) + \frac{(0.15)^2\,f''(25)}{2} + \frac{(0.15)^3\,f'''(25)}{6}$$

ACADEMY

19:37

$$f'(x) = \frac{1}{2\sqrt{x}} = \frac{1}{2x^{1/2}} \qquad f'(25) = 0.1$$

$$f''(x) = \frac{1\left(-\frac{1}{2}\right)}{2\,x^{3/2}} = \frac{-1}{4\,x^{3/2}} \qquad f''(25) = \frac{-1}{500}$$

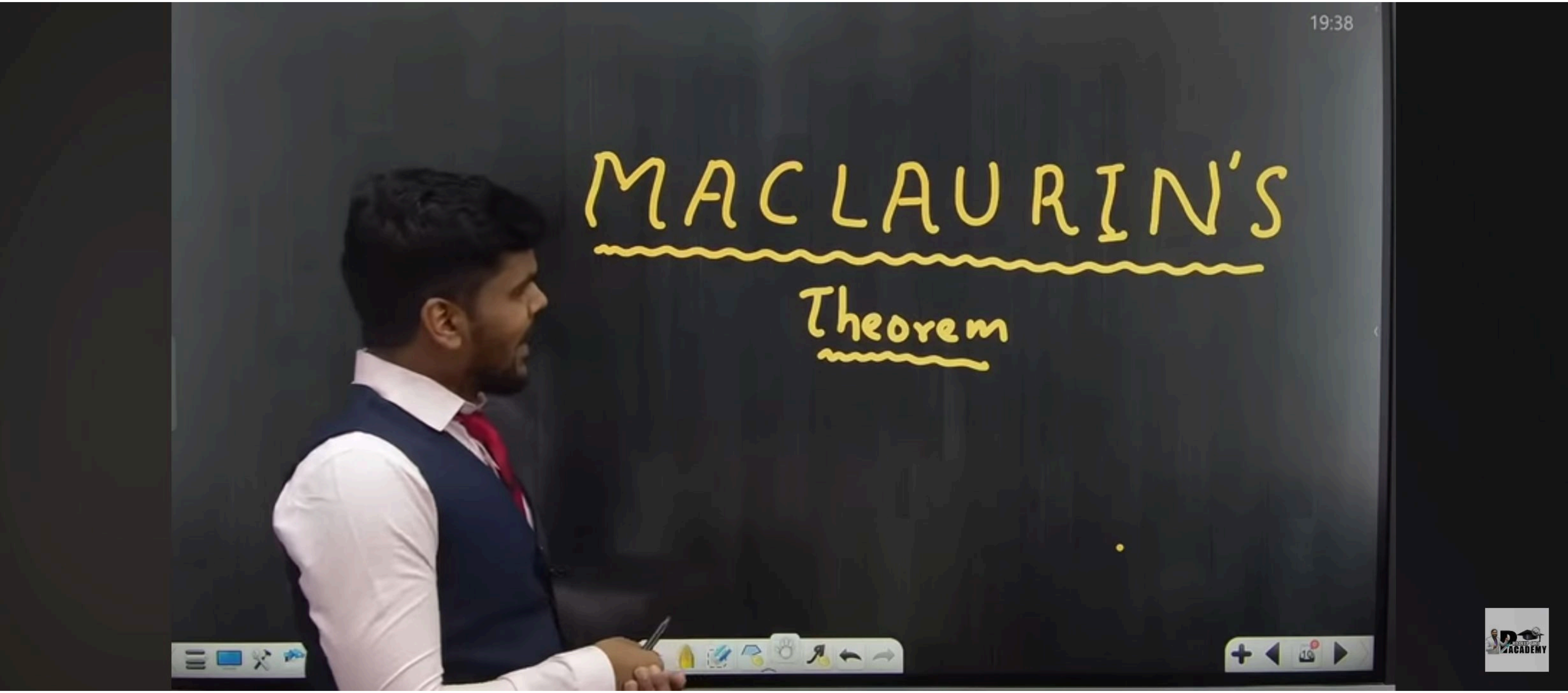
$$f'''(x) = \frac{-1\left(-\frac{3}{2}\right)}{4\,x^{5/2}} = \frac{3}{8\,x^{5/2}} \qquad f'''(25) = \frac{3}{25000}$$

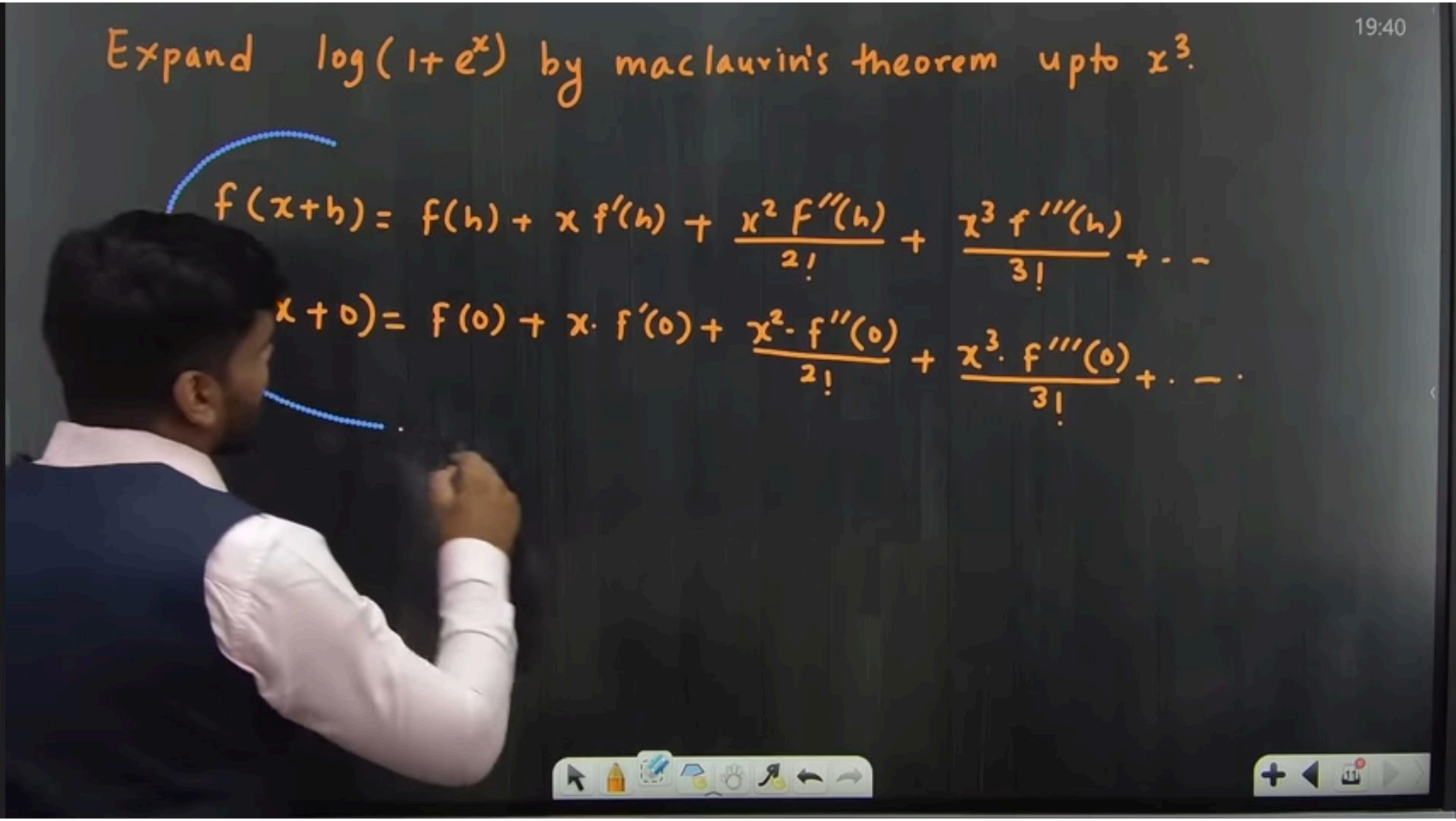
$$\ldots + h) = f(x) + h f'(x) + \frac{h^2 f''(x)}{2!} + \frac{h^3 f'''(x)}{3!} + \ldots$$

$$= f(25) + 0.15\, f'(25) + \frac{(0.15)^2 \cdot f''(25)}{2} + \frac{(0.15)^3\, f'''(25)}{6}$$

$$= 5 + 0.15 \times 0.1 + \frac{(0.15)^2 \cdot (-1)}{500 \times 2} + \frac{(0.15)^3 \times 3}{25000 \times 6}$$

$$= 5.0149775$$


19:38
MACLAURIN'S
Theorem
ACADEMY


19:40
Expand $\log(1+e^x)$ by maclaurin's theorem upto x^3.
$f(x+h) = f(h) + x f'(h) + \frac{x^2 f''(h)}{2!} + \frac{x^3 f'''(h)}{3!} + \cdots$
$x+0) = f(0) + x \cdot f'(0) + \frac{x^2 \cdot f''(0)}{2!} + \frac{x^3 \cdot f'''(0)}{3!} + \cdots$

19:43

Expand $\log(1+e^x)$ by maclaurin's theorem upto x^3.

$$f(x) = \log(1+e^x)$$

$$f'(x) = \frac{1}{1+e^x} \times e^x = \frac{e^x}{1+e^x}$$

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

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

1

19:44

$$f'(x) = \frac{1}{1+e^x} \times e^x = \frac{e^x}{1+e^x}$$

$$(\quad)^2 = x^n$$

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

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

$$f'''(x) = \frac{(1+e^x)^2\, e^x - e^x \cdot 2(1+e^x)' \cdot e^x}{(1+e^x)^4}$$

$$f'''(x) = \frac{(1+e^x)^2 \cdot e^x - 2e^x(1+e^x)\cdot e^x}{(1+e^x)^4}$$

19:46

$$\frac{\quad}{(1+e^x)^2} = \frac{e^x}{(1+e^x)^2}$$

$$f'''(x) = \frac{(1+e^x)^2 e^x - e^x \cdot 2(1+e^x)' \cdot e^x}{(1+e^x)^4}$$

$$f'''(x) = \frac{(1+e^x)^2 \cdot e^x - 2e^x(1+e^x) \cdot e^x}{(1+e^x)^4}$$

$$f'''(x) = \frac{e^x\cancel{(1+e^x)}\,[1+e^x-2e^x]}{(1+e^x)^4} \qquad 1-2$$

$$f'''(x) = \frac{e^x[1-1e^x]}{(1+e^x)^3}$$

$$\frac{\quad}{(1+e^x)^2} = \frac{e}{(1+e^x)^2}$$

$$f'''(x) = \frac{(1+e^x)^2 e^x - e^x \cdot 2(1+e^x)' \cdot e^x}{(1+e^x)^4}$$

$$f'''(x) = \frac{(1+e^x)^2 \cdot e^x - 2e^x(1+e^x) \cdot e^x}{(1+e^x)^4}$$

$$f'''(x) = \frac{e^x(\cancel{1+e^x})\left[1+e^x-2e^x\right]}{(1+e^x)^4}$$

$1 - 2$

$$f'''(x) = \frac{e^x\left[1-1e^x\right]}{(1+e^x)^3}$$

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

19:46

19:49

Expand $\log(1+e^x)$ by maclaurin's theorem upto x^3.

$f(x) = \log(1+e^x)$

[illegible] $\times e^x = \dfrac{e^x}{1+e^x}$

[illegible] $\dfrac{(1+e^x)\cdot e^x - e^x\cdot(e^x)}{(1+e^x)^2}$

$= \dfrac{e^x + \cancel{e^{2x}} - \cancel{e^{2x}}}{(1+e^x)^2} = \dfrac{e^x}{(1+e^x)^2}$

[illegible] $\dfrac{(1+e^x)^2 e^x - e^x\cdot 2(1+e^x)'\cdot e^x}{(1+e^x)^4}$

[illegible] $e^x)^2\cdot e^x - 2e^x(1+e^x)\, e^x$ [illegible]

$\boxed{f(0) = \log 2}$

$\boxed{f'(0) = \frac{1}{2}}$

$\boxed{f''(0) = \frac{1}{4}}$

$\boxed{f'''(0) = }$


19:50
(1+e^x)^2 = (1+e^x)^2
f'''(0) = 0
f'''(x) = [(1+e^x)^2 e^x - e^x · 2(1+e^x)' · e^x] / (1+e^x)^4
1 - 2

$$(1+e^x)^3$$

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

$$f(x) = f(0) + x \cdot f'(0) + \frac{x^2 \cdot f''(0)}{2!} + \frac{x^3 \cdot f'''(0)}{3!} + \cdots$$

$$= \log 2 + x \cdot \frac{1}{2} + \frac{x^2 \cdot \frac{1}{4}}{2} + \frac{x^3 \cdot 0}{3!} + \cdots$$

$$= \log 2 + \frac{x}{2} + \frac{x^2}{8} + 0$$

19:52

ACADEMY