Nishant Jindal

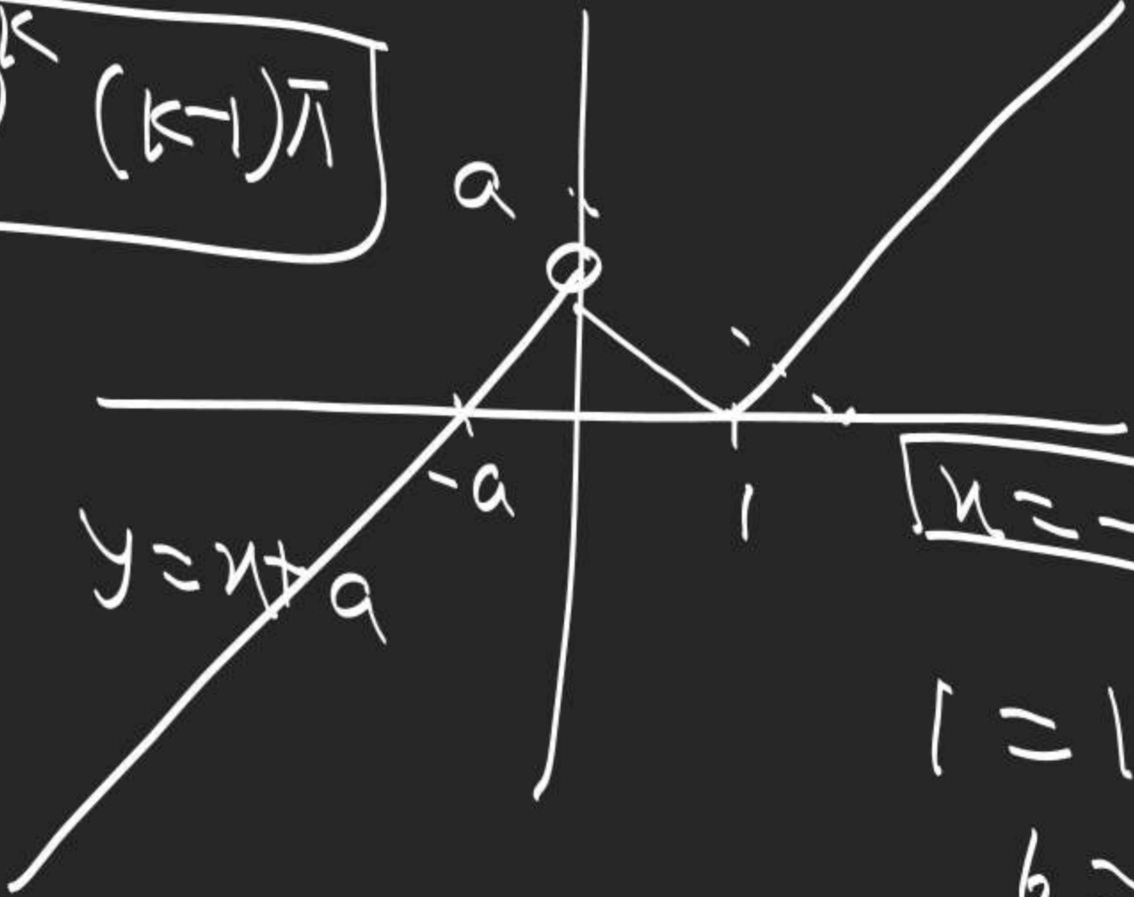
$$\lim_{h\to 0} \frac{(k-1)\sin(\pi k-\pi h)-0}{-h}$$

$$\frac{(k-1)(-1)^{k-1}\sin(\pi h)\,\pi}{-(\pi h)}$$

$a \geq 0$

$$\boxed{(-1)^{k}(k-1)\pi}$$

$$\frac{f(1+x)-f(1)}{f(1)\,x}$$



$$7:\ g(f(x)) = \begin{cases} f(x)+1 & f(x)<0 \\ (f(x)-1)^2+b & f(x)\geq 0 \end{cases}$$

$$= \begin{cases} x+a+1 & x<-a \\ (x+a-1)^2+b & x\in[-a,0) \\ (|x-1|-1)^2+b & x\geq 0 \end{cases}$$

$\boxed{x=-a}$

$1 = 1+b$

$b = 0$

$\underline{x=0}$ $(a-1)^2 = 0$

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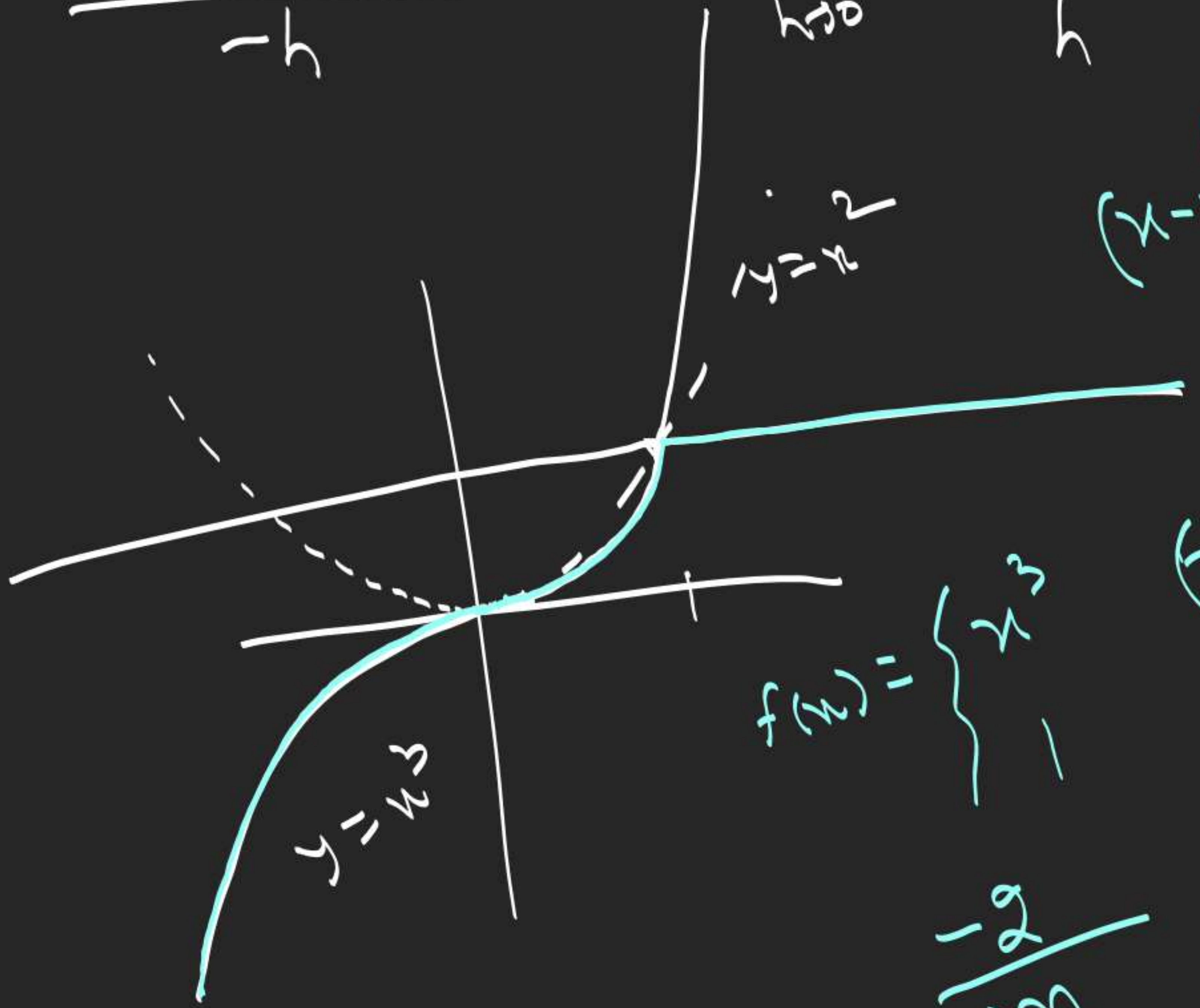
$$\lim_{h\to 0} \frac{f(-a-h)-f(-a)}{-h} = \lim_{h\to 0} \frac{f(a+h)-f(a)}{h} = \lim_{h\to 0} \frac{f(a-h)-f(a)}{h} = 0.$$



$(x-1)^{n-2}$

$$f(x) = \begin{cases} x^3 & (-\infty, 1] \\ 1 & (1, \infty). \end{cases}$$

$\boxed{n=2}$

$\frac{-2}{m}$

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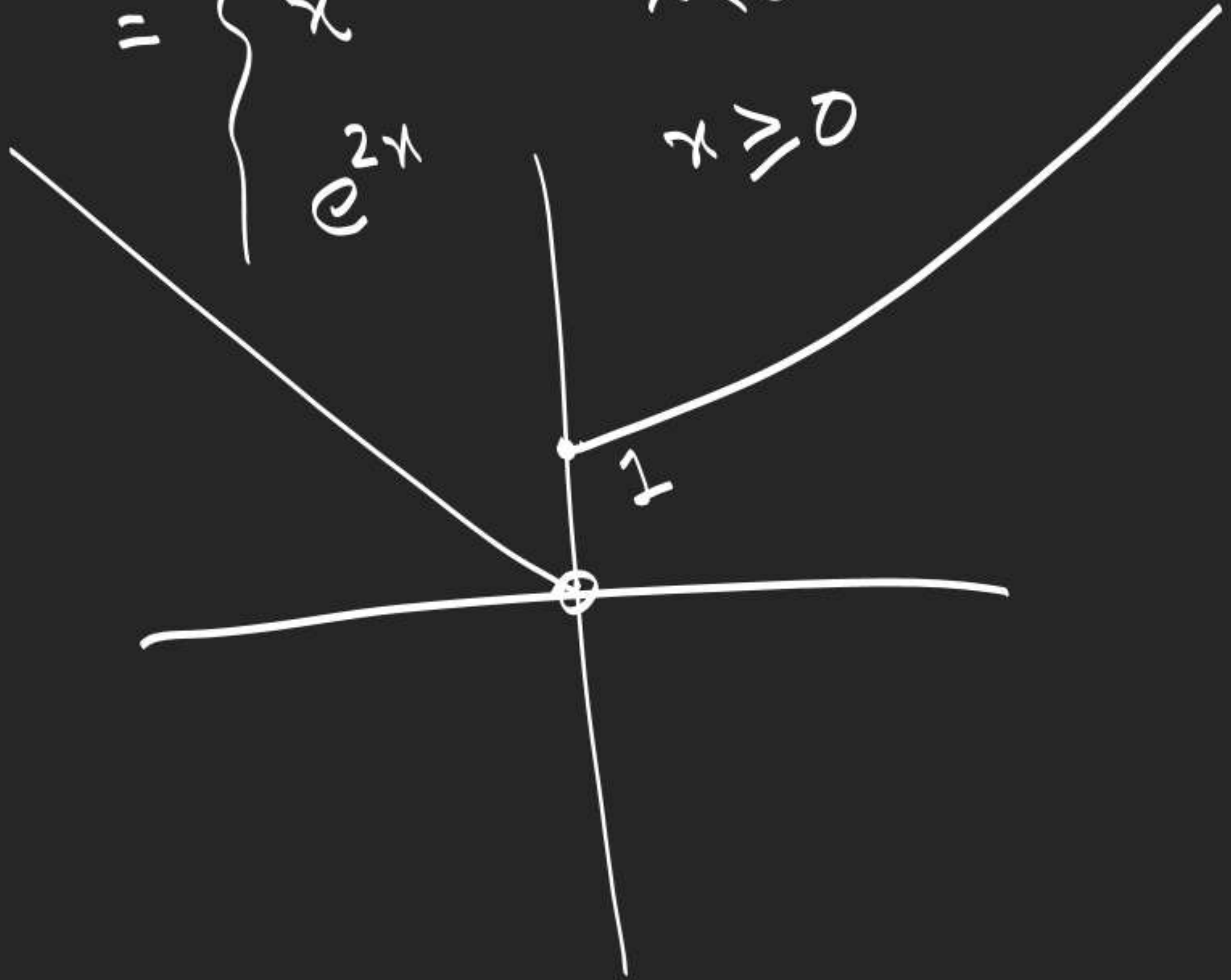
$$f_2(f_1(x)) = (f_1(x))^2 \qquad f_1(x) \geq 0 .$$

$$= \begin{cases} x^2 & x < 0 \\ e^{2x} & x \geq 0 \end{cases}$$



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$$\lim_{x\to 0}\frac{h(f(x))-h(f(0))}{x} = \lim_{x\to 0}\frac{e^{|f(x)|}-1}{|f(x)|}\cdot\frac{|f(x)|}{x} = 0.$$

$$\frac{|g(x)-g(0)|}{|x|}\cdot\frac{|x|}{x}$$

$$f(x)=\frac{x}{|x|}g(x)$$

$x=1$

$$a\cos(x^3-x)+b|x|\sin\left(|x|(x^2+1)\right)$$

Nishant Jindal

$$\frac{d^2y}{dx^2} = \frac{d}{dx}\left(\frac{dy}{dx}\right)$$

$$\frac{d^3y}{dx^3} = \frac{d}{dx}\left(\frac{d^2y}{dx^2}\right)$$

$$\vdots$$

$$\frac{d^ny}{dx^n} = \frac{d}{dx}\left(\frac{d^{n-1}y}{dx^{n-1}}\right)$$

$x = f(t)$ ✓

$y = g(t)$ ✓

$$\boxed{\frac{dy}{dx} = \frac{\frac{dy}{dt}}{\frac{dx}{dt}}}$$

$$\frac{d^2y}{dx^2} = \frac{d}{dx}\left(\frac{dy}{dx}\right)$$

Nishant Jindal

1. If $y = \sin(\sin x)$, then P.T.

$$y_2 + (\tan x) y_1 + y\cos^2 x = 0$$

remaining
$\downarrow$
2×5

$y_1 = \frac{dy}{dx}$

$y_2 = \frac{d^2y}{dx^2}$

$$y_1 = \cos(\sin x)\cos x$$

$$y_2 = -\sin x \cos(\sin x) + \cos x(-\sin(\sin x))\cos x$$

$$y_2 = -\sin x \left(\frac{y_1}{\cos x}\right) + \cos^2 x(-y)$$

2. If $x = 2\cos t - \cos 2t$, $y = 2\sin t - \sin 2t$, find $\frac{d^2y}{dx^2}$ at $t = \frac{\pi}{2}$ $= \boxed{-\frac{3}{2}}$

8:15am

$$\frac{dy}{dx} = \frac{\cancel{2}\cos t - \cancel{2}\cos 2t}{-\cancel{2}\sin t + \cancel{2}\sin 2t} = \frac{\sin\frac{3t}{2}\sin\frac{t}{2}}{\sin\frac{t}{2}\cos\frac{3t}{2}} = \tan\frac{3t}{2}$$

$$\frac{d^2y}{dx^2} = \frac{d}{dx}\left(\tan\frac{3t}{2}\right) = \frac{d}{dt}\left(\tan\frac{3t}{2}\right)\frac{dt}{dx} = \frac{\frac{3}{2}\sec^2\frac{3t}{2}}{2\sin 2t - 2\sin t}$$

Nishant Jindal

1. if $y = a\cos(\ln x) + b\sin(\ln x)$,

then P.T. $x^2 y_3 + 3xy_2 + 2y_1 = 0$.

2. If $y^{\frac{1}{m}} + y^{-\frac{1}{m}} = 2x$, then P.T.

$(x^2 - 1)y_3 + 3xy_2 + (1 - m^2)y_1 = 0$.