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EXAM TARGET	SUBJECT	TIME	FACULTY
ALL PSUs	ENGINEERING MATHS	10:00 AM	ANANT SIR
GATE 2024-25	NETWORK THEORY	6:00 PM	RAVI SIR
GATE 2024-25	ELECTRICAL MACHINE	7:30 PM	SANTAN SIR
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GATE 2024-25	ENVIRONMENT	8:00 PM	PRATIK SIR
GATE 2024-25	SOM	9:00 PM	MUKESH SIR

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ALL PSUs	THERMODYNAMICS	3:00 PM	KANISTH SIR
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HMT	MONDAY Live @11AM	YOGESH SIR
PRODUCTION	TUESDAY Live @11AM	GAURAV SIR
SOM	WEDNESDAY Live @8PM	MUKESH SIR
THERMODYNAMICS	THURSDAY Live @11AM	KANISTH SIR
ENGINEERING MATHEMATICS	FRIDAY Live @11AM	ANANT SIR

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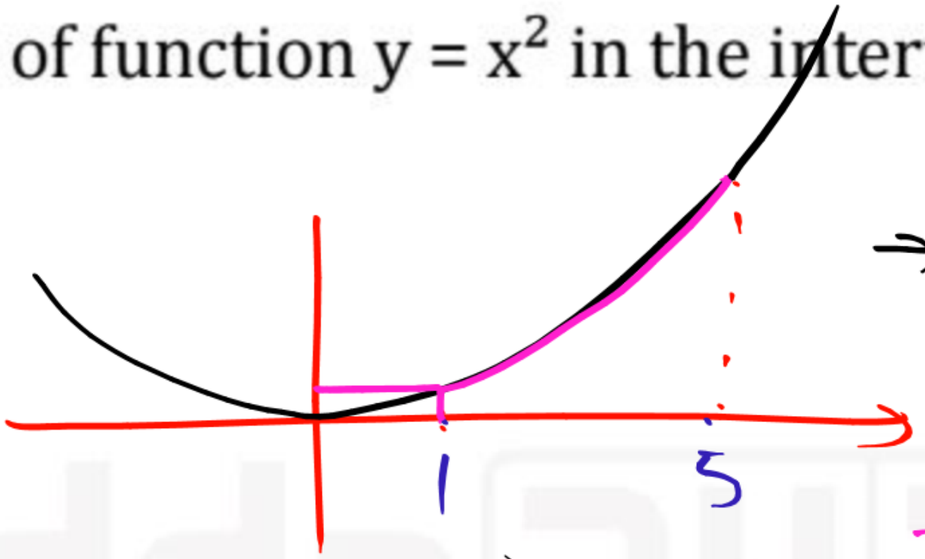
Q:55 The minimum value of function $y = x^2$ in the interval [1,5] is -

(a) 0

(b) 1

(c) 25

(d) undefined



$\Rightarrow$ minimum value is at $x = 1$

$f(x=1) = x^2|_{x=1}$

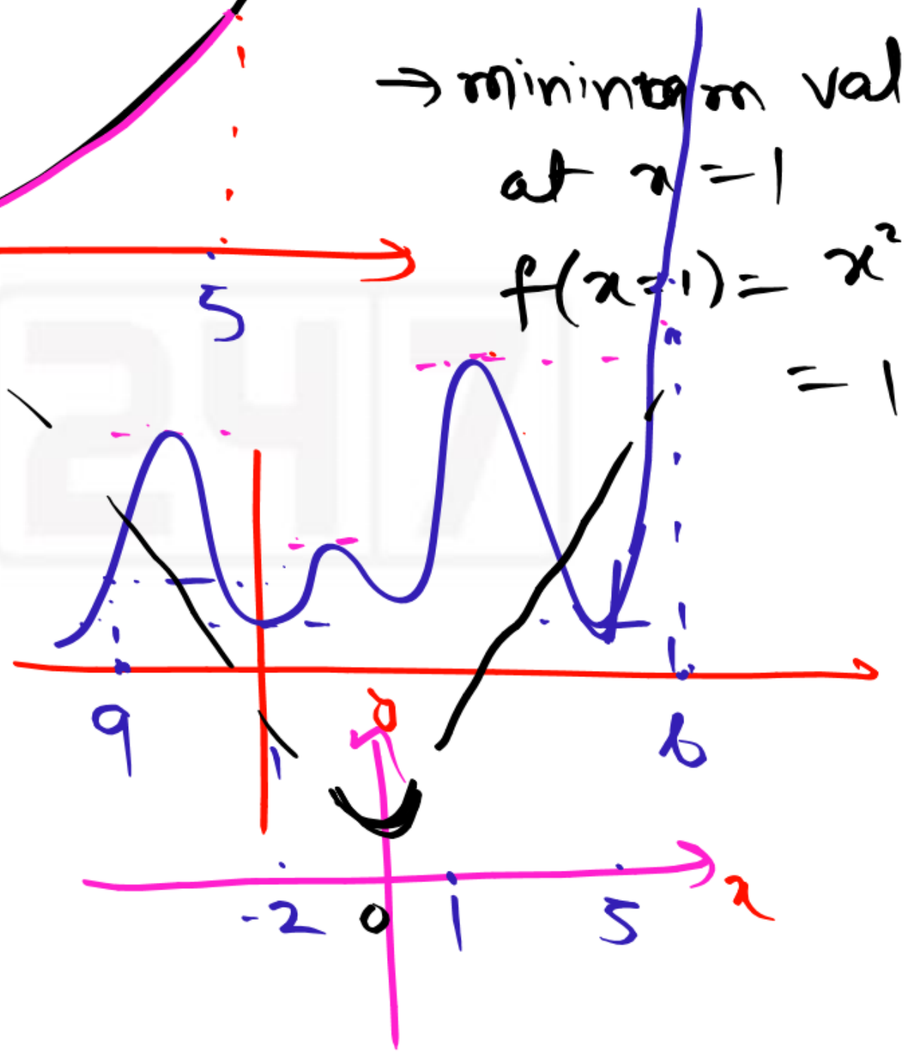
$= 1$

$\frac{dy}{dx} = 0$

$2x = 0 \Rightarrow x = 0$

$x = 0$ is the stationary point

$\left.\frac{d^2y}{dx^2}\right|_{x=0} = 2 > 0$ (minima)



Q:56 At x = 0, the function $f(x) = x^3 + 1$ has -

(a) a maximum value
(b) a minimum value
(c) a singularity
(d) a point of inflection

$f'(x) = 0$

$3x^2 = 0$

$x = 0$

$f''(x)\big|_{x=0} = 6x\big|_{x=0} = 0$ (further proceed)

$f'''(x)\big|_{x=0} = 6\big|_{x=0} \neq 0$ (point of inflection)

Q:57 For the function $f(x) = x^2 e^{-x}$, the maximum occurs when x is equal to -

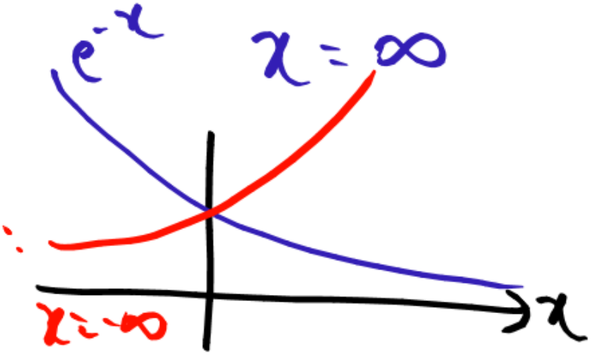
(a) 2
(b) 1
(c) 0
(d) - 1

$\frac{dy}{dx} = 0$

$-x^2e^{-x} + 2xe^{-x} = 0$

$e^{-x}(2x - x^2) = 0$

$e^{-x} = 0$ or $2x - x^2 = 0$



$x(2 - x) = 0$

$x = 0, x = 2$

$x = 0, 2 \& \infty$ are stationary

at $x = 0$

$\left.\frac{d^2y}{dx^2}\right|_{x=0} = +e^{-x}x^2 - 2xe^{-x} + 2\left(-xe^{-x} - e^{-x}\right)\Big|_{x=0}$

$= 2 > 0$ (minima)

$\left.\frac{d^2y}{dx^2}\right|_{x=2} = -ve$ (maxima)

Q:58 Consider function $f(x) = (x^2 - 4)^2$ where x is a real number. Then the function has -

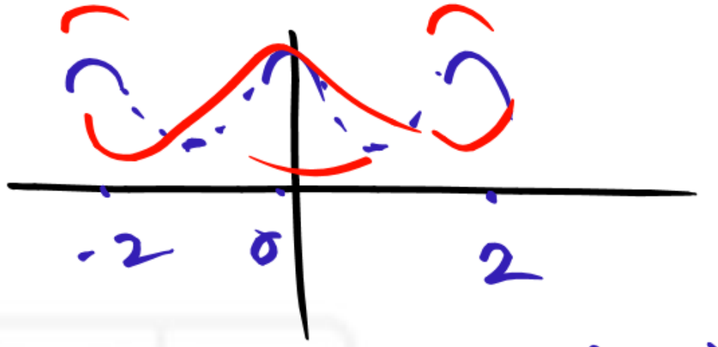
(a) only one minima

(b) only two minima

(c) three minima

(d) three maxima

$\frac{df(x)}{dx} = 0$



$2(x^2-4).2x = 0$

$x = 0, \quad x^2 - 4 = 0$

$x = \pm 2$

$f'(x) = 4x(x^2-4)$

$= 4x^3 - 16x$

$x = 0, -2, +2$ are stationary points

$f''(x) = 12x^2 - 16|_{x=0} = -16$ (maxima)

$f''(x=-2) = +ve$ (minima)

$f''(x=2) = +ve$ (minima)

Q:59 A cubic polynomial with real coefficients -

(a) can possibly have no extrema and no zero crossings

(b) may have up to three extrema and upto 2 zero crossings

(c) cannot have more than two extrema and more than three zero crossings

(d) will always have an equal number of extrema and zero crossings

$f(x) = ax^3 + bx^2 + cx + d$

$a, b, c, d \in R \ \& \ a \neq 0$

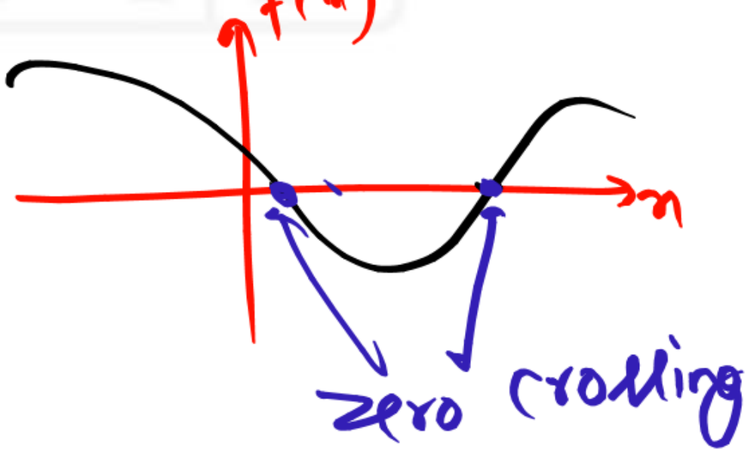
for zero crossings $f(x) = 0$

$ax^3 + bx^2 + cx + d = 0$

$x = 0, 0, 3$

3, 3, 3

extreme ← maxima, minima



Stationary point

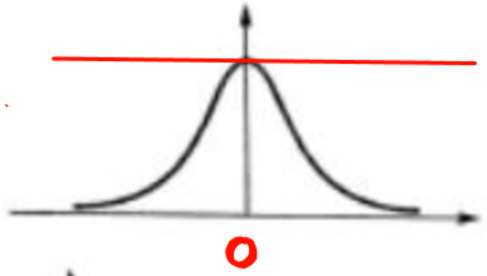
$f'(x) = 3ax^2 + 2bx + c$

$f'(x) = 0$

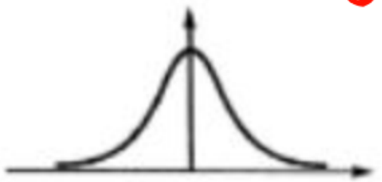
$x = x_1, x_2$

$b^2 - 4ac$

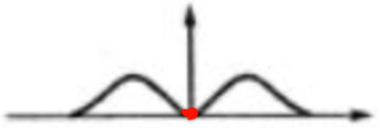
Q:60 The derivative of the symmetric function drawn in given figure will look like



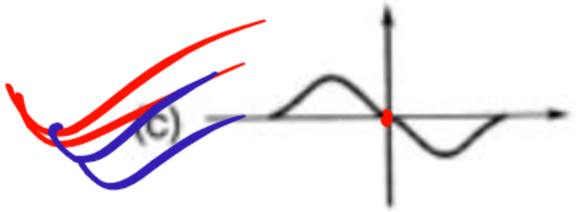
(a)



(b)

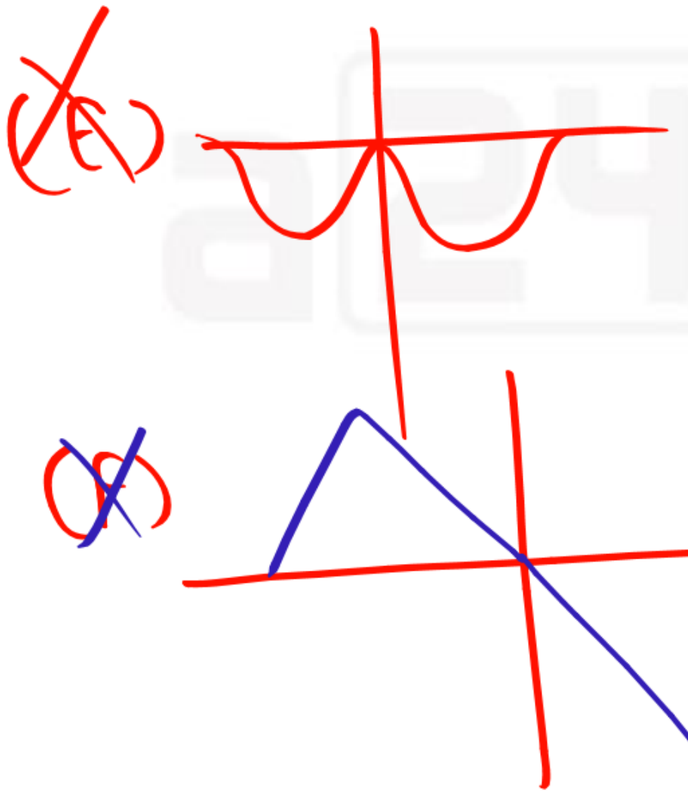


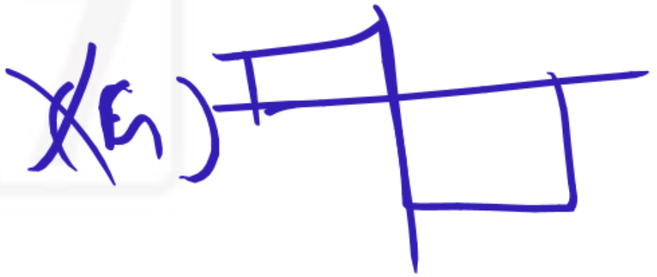
(c)

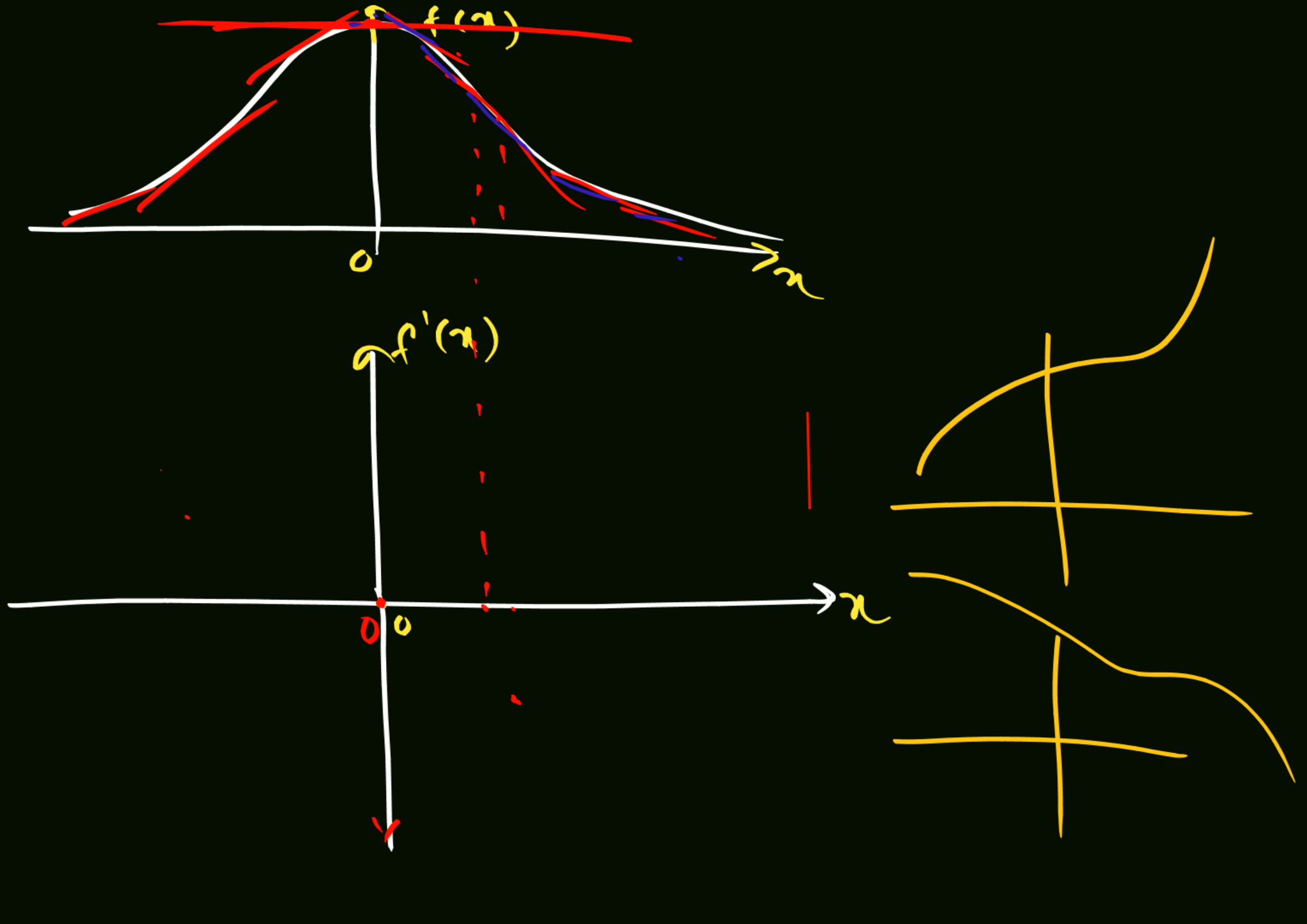


(d)

$\left.\frac{df(x)}{dx}\right|_{x=x_0}$ = slope of tangential to $f(x)$ at $x=x_0$






f(x)
0
x
f'(x)
0
0
x
y

Q:61 As x increased from $-\infty$ to ∞, the function

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

(a) monotonically increases
(b) monotonically decreases
(c) increases to a maximum value and then decreases
(d) decreases to a minimum value and then increases

Q:62 As x varies from -1 to $+3$, which one of the following describes the behaviour of the function $f(x) = x^3 - 3x^2 + 1$?

(a) $f(x)$ increases monotonically.

(b) $f(x)$ increases, then decreases and increases again.

(c) $f(x)$ decreases, then increases and decreases again.

(d) $f(x)$ increases and then decreases

Q:63 Consider the function $f(x) = -x^2 + 10x + 100$. The minimum value of the function in the interval [5, 10] is _____.

Q:64

The value of $\lim_{x \to \infty} \frac{x \ln(x)}{1 + x^2}$ is

(a) 1.0

(b) 0.5

(c) ∞

(d) 0

THANKS FOR

Watching

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