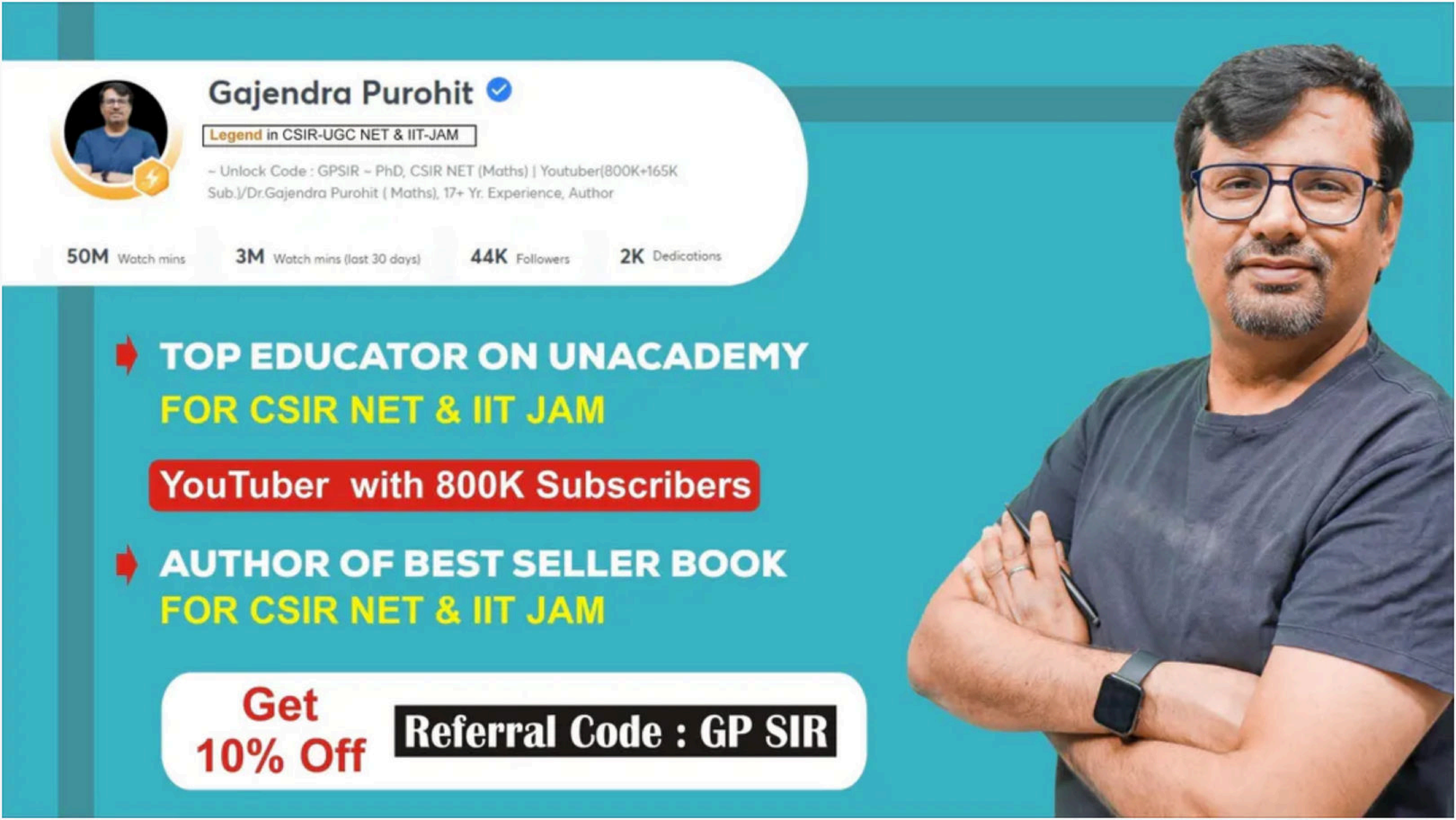

Gajendra Purohit
Legend in CSIR-UGC NET & IIT-JAM
~ Unlock Code : GPSIR ~ PhD, CSIR NET (Maths) | Youtuber(800K+165K Sub.)/Dr.Gajendra Purohit (Maths), 17+ Yr. Experience, Author
50M Watch mins
3M Watch mins (last 30 days)
44K Followers
2K Dedications
TOP EDUCATOR ON UNACADEMY
FOR CSIR NET & IIT JAM
YouTuber with 800K Subscribers
AUTHOR OF BEST SELLER BOOK
FOR CSIR NET & IIT JAM
Get 10% Off
Referral Code : GP SIR


unacademy
Detailed Course 2.0 on
Sequence and Series For IIT JAM' 23
October 26
9:00 AM
Gajendra Purohit
Enroll Now
Use code GPSIR for 10% off
unacademy


unacademy
DETAILED COURSE 2.0
GROUP THEORY FOR IIT JAM 2023
6th OCTOBER
Gajendra Purohit
Enroll Now
USE CODE
GPSIR
FOR 10% OFF
unacademy

FEE DETAILS FOR IIT JAM SUBSCRIPTION

No cost EMI available on 6 months & above subscription plans

24 months	Save 67%	₹ 908 / mo	Total ₹ 21,780	You get 6 months extra for free — Offer expires 15 Jun 2022
12 months	Save 54%	₹ 1,248 / mo	Total ₹ 14,974	You get 6 months extra for free — Offer expires 15 Jun 2022
9 months	Save 45%	₹ 1,497 / mo	Total ₹ 13,475	
6 months	Save 25%	₹ 2,042 / mo	Total ₹ 12,252	
3 months	Save 17%	₹ 2,269 / mo	Total ₹ 6,807	
1 month		₹ 2,723 / mo	Total ₹ 2,723	

To be paid as a one-time payment

Have a referral code? Proceed to pay

Get 10% Off

After Using My Referral Code

No cost EMI available on 6 months & above subscription plans

24 months	Save 67%	₹ 817 / mo	₹ ~~21,700~~ ₹ 19,602	You get 6 months extra for free — Offer expires 15 Jun 2022
12 months	Save 54%	₹ 1,123 / mo	₹ ~~14,974~~ ₹ 13,477	You get 6 months extra for free — Offer expires 15 Jun 2022
9 months	Save 45%	₹ 1,348 / mo	₹ ~~13,475~~ ₹ 12,128	
6 months	Save 25%	₹ 1,838 / mo	₹ ~~12,252~~ ₹ 11,027	
3 months	Save 17%	₹ 2,042 / mo	₹ ~~6,807~~ ₹ 6,126	

GPSIR

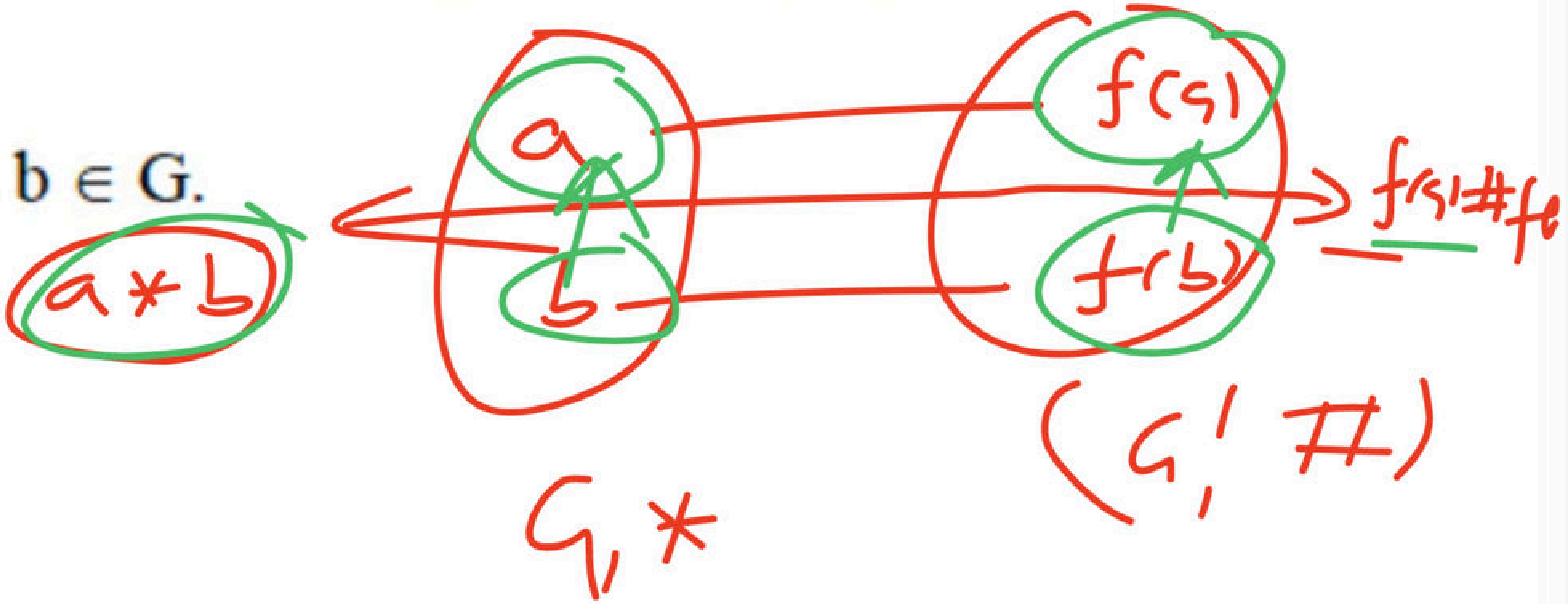
Awesome! You get 10% off

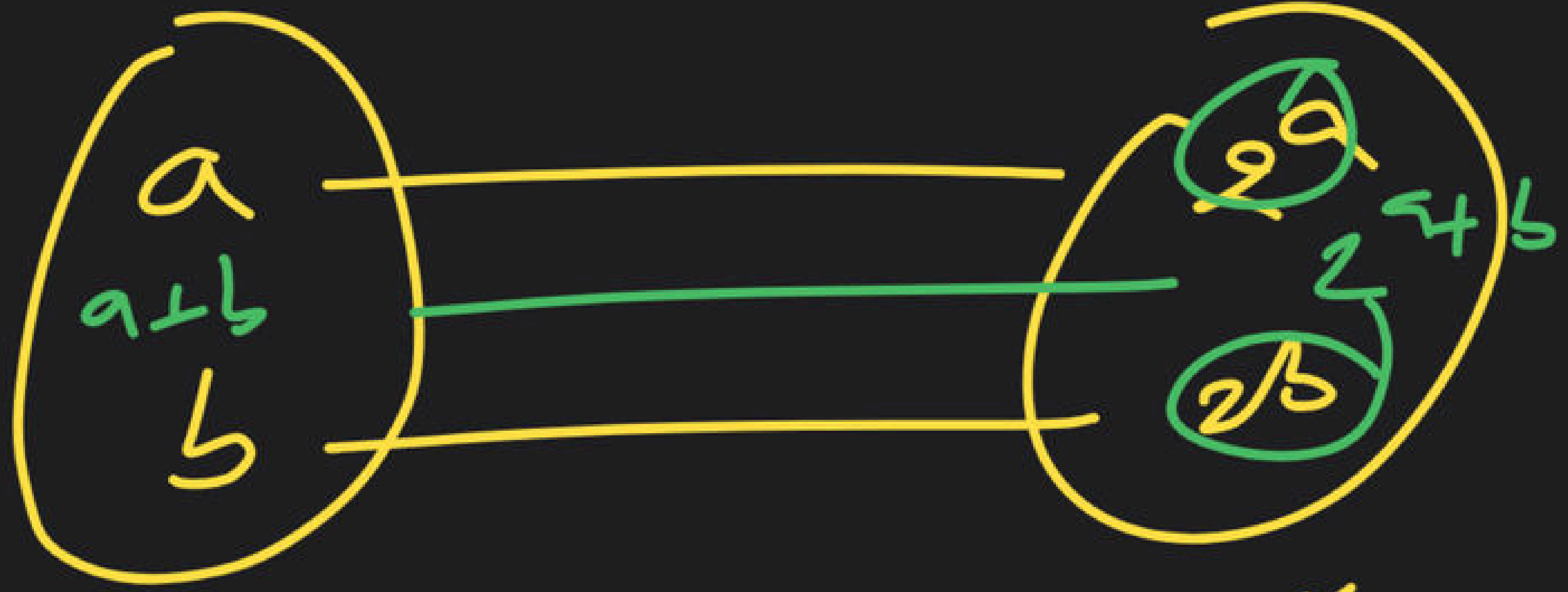
Proceed to pay

Group Homomorphism

Definition : Let (G, *) and (G`, #) are two groups. A mapping f from G to G` is said to homomorphism

if f(a * b) = f(a) # f(b) ; for all a, b ∈ G.





$(\mathbb{R}, +)$ $\qquad$ $(\mathbb{R}^*, \cdot)$

$f(a) = 2^a$

$2^{a+b} = 2^a \cdot 2^b$

$f(a) \cdot f(b)$

$(\mathbb{R}, \cdot)$ $\qquad$ $(\mathbb{R}, \cdot)$

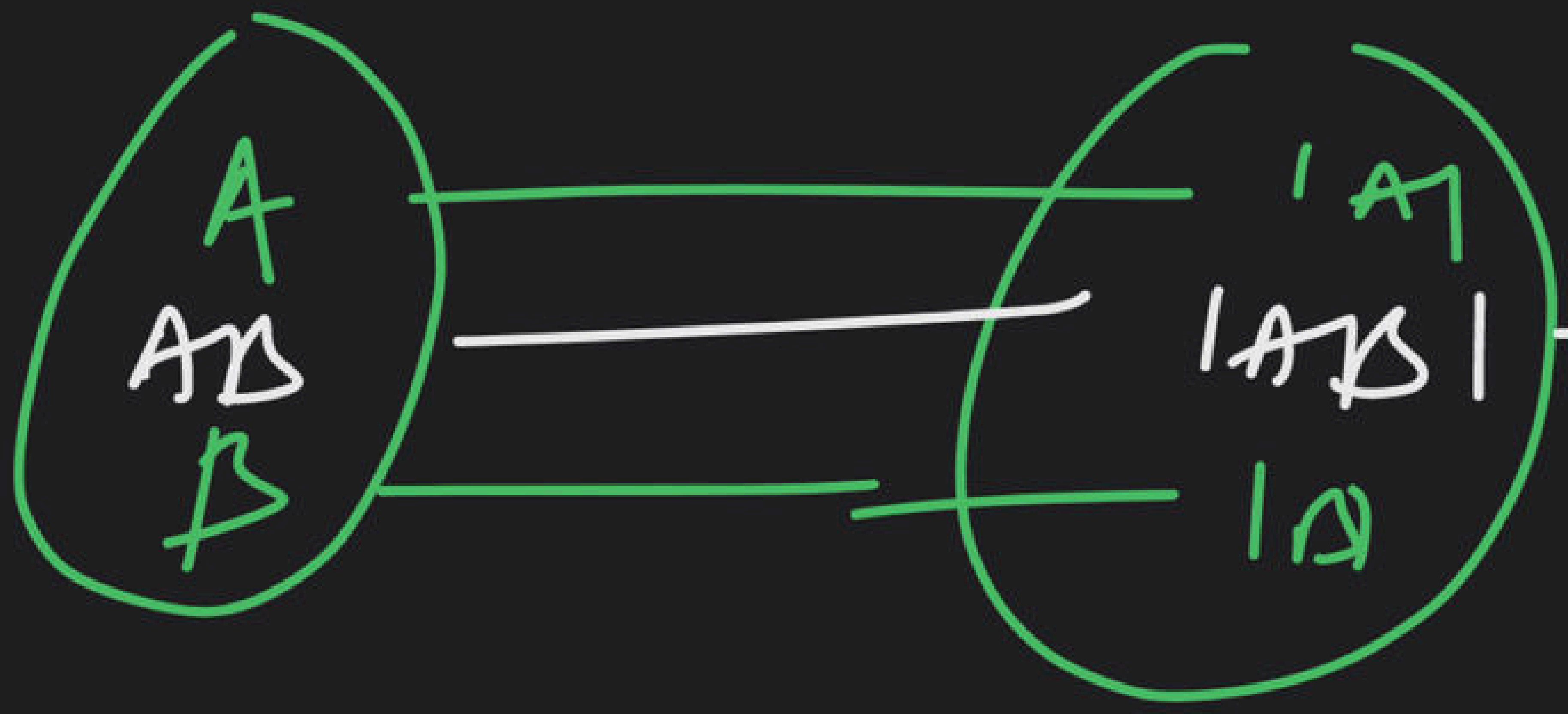
$f(x) = e^x$

$f(xy) = f(x)\, f(y)$

$= e^x e^y$

$\neq e^{xy}$

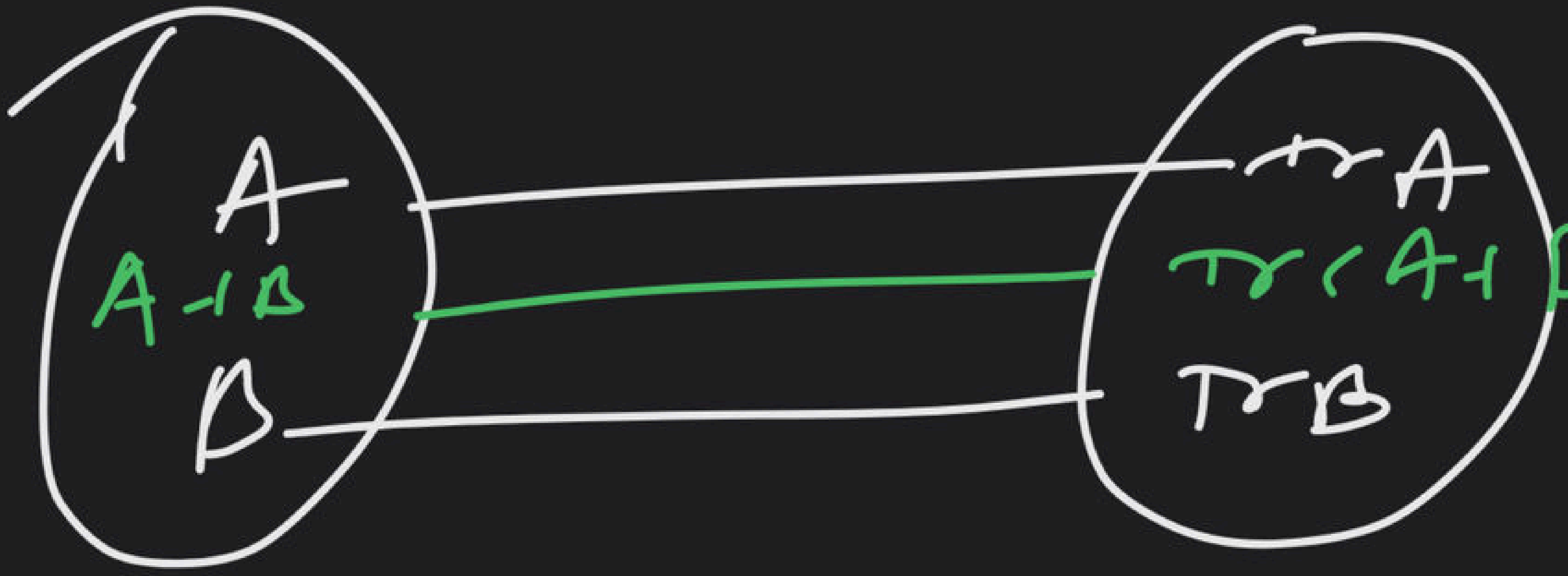
$$f : GL(n, F_\varepsilon) \longrightarrow F_\varepsilon^*, \quad f(A) = |A|$$



$$|AB| = |A||B| = f(A)f(B)$$

$GL(n, F_\varepsilon)$ $\qquad$ F_ε^*

$f : (M_n(\mathbb{R}), +) \longrightarrow (\mathbb{R}, +) \qquad f(A) = Tr(A)$



$Tr(A+B) = Tr(A) + Tr(B)$

$f(A) + f(B)$

$f(A+B) = f(A) + f(B)$

Q.1. Let G be a ~~non~~-abelian group, $y \in G$ and let the maps f, g, h from G to itself be defined by

$f(x) = yxy^{-1}$, $g(x) = x^{-1}$ & $h = g \circ g$. Then

$h = g(g(x))$
$= g(x^{-1})$

(a) g and h are homomorphism and f is not a homomorphism.

(b) h is homomorphism & g is not a homomorphism.

$h(x) = x$

(c) f is homomorphism & g is not a homomorphism.

(d) f, g & h are homomorphism.

$f(xy) = f(x)\, f(y)$

Q.2. Which of the following condition on a group G implies that G is abelian?

(a) The order of G is p^3 for some prime p

(b) Every proper subgroup of G is cyclic.

(c) Every subgroup of G is normal in G.

(d) ~~The function f : G~~ $\rightarrow$ G defined by $f(x) = x^{-1}$ for all $x \in G$ is a homomorphism.

Q_8

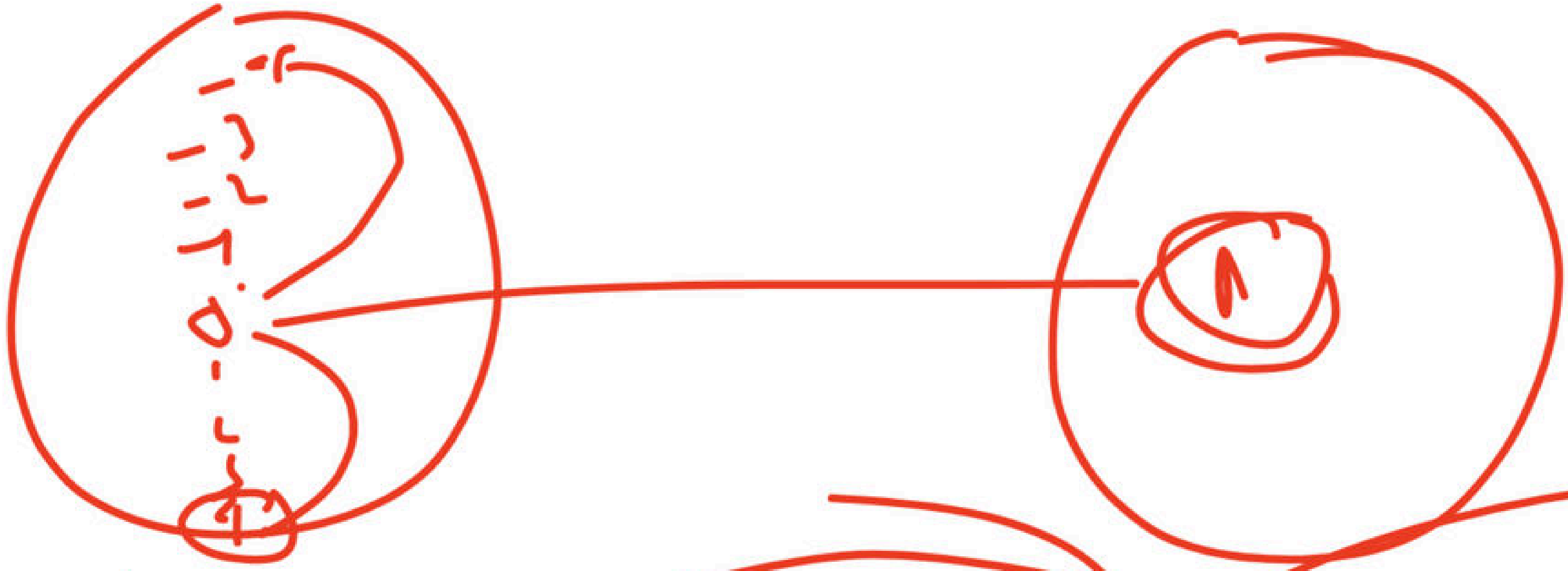
$f(xy) = (xy)^{-1} = y^{-1}x^{-1}$

$= x^{-1}y^{-1}$

$= f(x)f(y)$

Kernel of homomorphism : Let $f : G \to G'$ be a homomorphism then the set $k = \{x \in G;\ f(x) = e',$ where e' is identity of $G'\}$ is called kernel of homomorphism.

$f(n) = i^n,\ n \in \mathbb{Z}$



$(\mathbb{Z}, +)$

$\ker f = 4\mathbb{Z}$

$G = \{1, -1, i, -i\}$

$(G, *)$

$\{-8, -4, 0, 4, 8\} = 4\mathbb{Z}$

$f : \mathbb{Z}_6 \to \mathbb{Z}_{10}$

$f(x) = 5x$

$\mathbb{Z}_6 = \{0, 1, 2, 3, 4, 5\}$

$f(0) = 0$

$f(1) = 5$

$f(2) = 0$

$f(3) = 5$

$f(4) = 0$

$f(5) = 5$

$\mathrm{Ker}\, f = \{0, 2, 4\}$

$\mathbb{Z}_3$

$\mathrm{Ran} = \{0, 5\}$

$$f : \mathbb{Z}_6 \longrightarrow \mathbb{Z}_6 \qquad f(x) = x$$

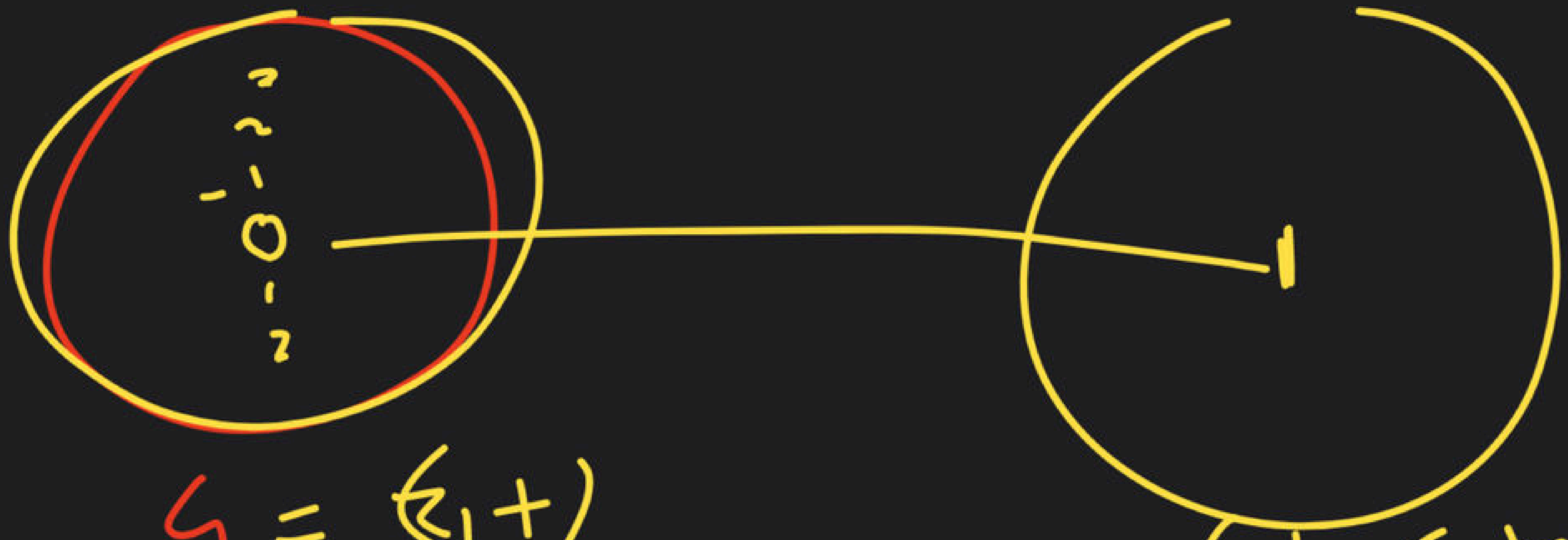
$$f(0) = 0$$
$$f(1) = 1$$
$$f(2) = 2$$
$$f(3) = 3$$
$$f(4) = 4$$
$$f(5) = 5$$

$$\ker f = \{0\}$$

$$\text{Range } f = \{0, 1, 2, 3, 4, 5\} = \mathbb{Z}_6$$

One-one homomorphism : Let $f : G \to G`$ be a homomorphism and ker f is kernel of f, then f is called one – one homomorphism if ker (f) = e.

Another definition : Let $f : G \to G`$ be a homomorphism, then it is called one-one homomorphism if $m_1 \neq m_2 \Rightarrow f(m_1) \neq f(m_2)$



$G = (\mathbb{Z}, +)$

$G' = (2^m, m \in \mathbb{Z})$

$f : G \to G'$

$f(m) = 2^m$

$\operatorname{Ker} f = \langle 0 \rangle$

$f : \mathbb{Z}_4 \longrightarrow \mathbb{Z}_2$

$f(x) = 1 \cdot x$

$f(0) = 0$
$f(1) = 1$
$f(2) = 0$
$f(3) = 1$

$\text{Ran} = \{0, 1\} = \mathbb{Z}_2$

$f : \mathbb{Z}_6 \to \mathbb{Z}_4$

$f(x) = 2x$

(a) one one homo

(b) onto homo.

(c) $\ker f = \{1, 4\}$

(d) $\operatorname{Rang} f = \{0, 2\}$ $\{0, 2\}$

$\ker f = \{0, 2, 4\}$

$f(0) = 0$
$f(1) = 2$
$f(2) = 0$
$f(3) = 2$
$f(4) = 0$
$f(5) = 2$

$$f : GL(n, \mathbb{F}_2) \longrightarrow \mathbb{F}_2^{*}, \quad f(A) = |A|$$

$$A = \begin{bmatrix} 4 & 0 \\ 0 & 1 \end{bmatrix}$$

$$|A| = 4$$

$$B = \begin{bmatrix} 2 & 0 \\ 0 & 2 \end{bmatrix}$$

$$|B| = 4$$

$$A \neq B$$

$$f(A) \neq f(B)$$

$$A = B$$

$$f(A) = f(B)$$

$f : (M_n(\mathbb{R}), +) \longrightarrow (\mathbb{R}, +)$

$f(A) = Tr(A)$

$A = \begin{pmatrix} 4 & 0 \\ 0 & -7 \end{pmatrix}$ $\quad B = \begin{pmatrix} 5 & 0 \\ 0 & -2 \end{pmatrix}$

$\ker f = \{O\}$

$\begin{pmatrix} 0 & 0 \\ 0 & 0 \end{pmatrix} \longrightarrow 0$

Note :

(1) ker(f) is a subgroup of G.

(2) ker(f) is normal subgroup of G.

Image/Range of a homomorphism :

Let $f : G \to G`$ be a homomorphism then $f(G) = \{T(x) \mid x \in G\}$ is called range/image of homomorphism.

Onto Homomorphism : Let $f : G \to G`$ be a homomorphism and it is called onto homomorphism if $f(G) = G`$

COMPLETE COURSE ON
MATHEMATICS
FOR IIT-JAM 2022

TOPICS TO BE COVERED

- REAL ANALYSIS
- FUNCTION OF ONE & TWO VARIABLE
- LINAER ALGEBRA
- MODERN ALGEBRA

TOPICS TO BE COVERED

- SEQUENCE & SERIES
- INTEGRAL CALCULUS
- VECTOR CALCULUS
- DIFFERENTIAL EQUATION

FEE DETAILS FOR IIT JAM SUBSCRIPTION

No cost EMI available on 6 months & above subscription plans

24 months	₹ 908 / mo
Save 67%	Total ₹ 21,780
You get 6 months extra for free	Offer expires 15 Jun 2022

12 months	₹ 1,248 / mo
Save 54%	Total ₹ 14,974
You get 6 months extra for free	Offer expires 15 Jun 2022

9 months	₹ 1,497 / mo
Save 45%	Total ₹ 13,475

6 months	₹ 2,042 / mo
Save 25%	Total ₹ 12,252

3 months	₹ 2,269 / mo
Save 17%	Total ₹ 6,807

1 month	₹ 2,723 / mo
	Total ₹ 2,723

To be paid as a one-time payment

Have a referral code?

Proceed to pay

Get 10% Off

After Using My Referral Code

GPSIR

Awesome! You get 10% off

No cost EMI available on 6 months & above subscription plans

24 months	₹ 817 / mo
Save 67%	~~₹ 21,780~~ ₹ 19,602
You get 6 months extra for free	Offer expires 15 Jun 2022

12 months	₹ 1,123 / mo
Save 54%	~~₹ 14,974~~ ₹ 13,477
You get 6 months extra for free	Offer expires 15 Jun 2022

9 months	₹ 1,348 / mo
Save 45%	~~₹ 13,475~~ ₹ 12,128

6 months	₹ 1,838 / mo
Save 25%	~~₹ 12,252~~ ₹ 11,027

3 months	₹ 2,042 / mo
Save 17%	~~₹ 6,807~~ ₹ 6,126

Proceed to pay

FOUNDATION COURSE OF

MATHEMATICS

FOR CSIR-NET

Definition : Let G and G` be any two groups, then

1. An onto homomorphism from a group G to another group G` is called Epimorphism.
2. A one-one homomorphism from a group G to another group G` is called Monomorphism.
3. A homomorphism from group G to itself is called Endomorphism.
4. A one-one and onto homomorphism from a group G to another group G` is called Isomorphism.
5. A one-one and onto homomorphism from a group G to itself is called Automorphism.

Basic Properties of Homomorphism

1. $f(e) = e`$, where e and e` are identity elements of G and G` respectively.

2. $f(x^{-1}) = (f(x))^{-1}$, for all $x \in G$

3. $f(x^n) = (f(x))^n$ for all $x \in G$, $n \in Z$

4. Let $f : G \to G`$ be a homomorphism, then ker f is a normal subgroup of G.

Fundamental Theorem of Homomorphism :

Let $f : G \to G`$ is a onto homomorphsim from G to G` if ker(f) is a kernel of f, then

$$\frac{G}{\ker(f)} \approx f(G) \approx G`$$

$$\Rightarrow \quad \frac{G}{\ker(f)} \approx G`$$

Note : Let f : G → G\` is a group homomorphism then $\frac{G}{\ker(f)}$ is a subgroup of G\` because $\frac{G}{\ker(f)} \approx f(G)$ & f(G) is a subgroup of G\`, then $O\left[\frac{G}{\ker(f)}\right] \Big| O(G`)$.

Q.3. Let $f : Z_{14} \to Z_{10}$ be a homomorphism with $O(\ker f) = 7$ then order of range set of f is

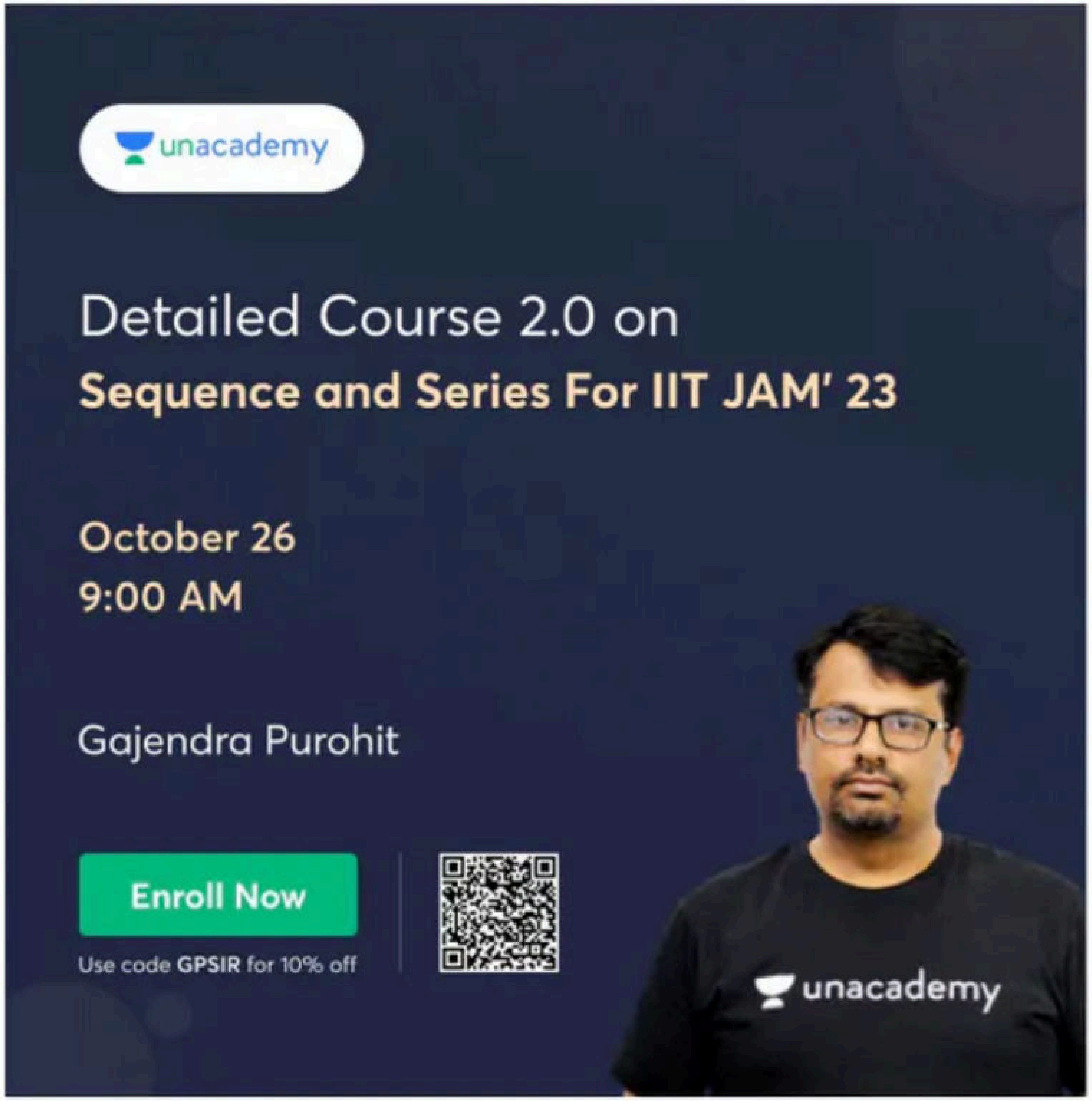
(a) 1 (b) 2

(c) 5 (d) 10

Q.4. Let $f : Z_{10} \to Z_8$ be a homomorphism then which of the following possible order for Kernal of f

(a) 2 (b) 5

(c) 8 (d) 1


unacademy
Detailed Course 2.0 on
Sequence and Series For IIT JAM' 23
October 26
9:00 AM
Gajendra Purohit
Enroll Now
Use code GPSIR for 10% off
unacademy


unacademy
DETAILED COURSE 2.0
GROUP THEORY FOR IIT JAM 2023
6th OCTOBER
Gajendra Purohit
Enroll Now
USE CODE
GPSIR
FOR 10% OFF
unacademy

unacademy CSIR-UGC NET Search Login

Educator Profile

Gajendra Purohit

#5 Educator in CSIR-UGC NET

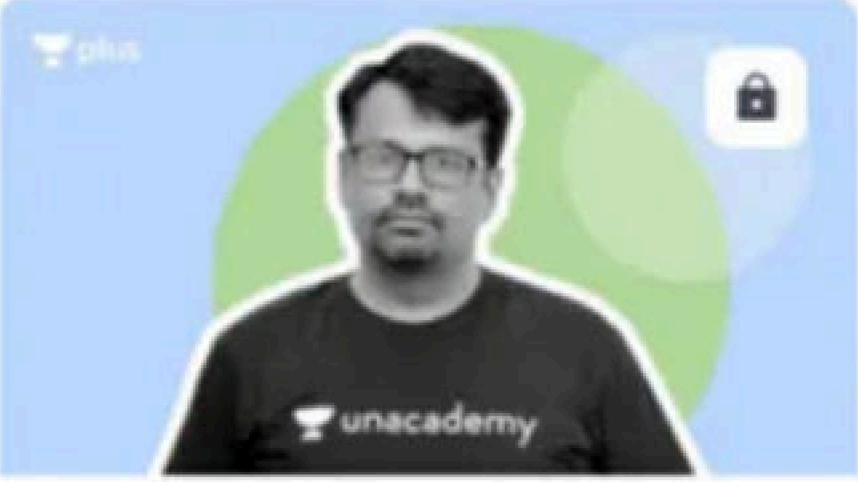
Dr.Gajendra Purohit PhD, CSIR NET (Maths) | Youtuber(330K+30k Sub.)/Dr.Gajendra Purohit (Maths), 17+ Yr. Experience, Author of Bestseller

Follow

11M Watch mins | **1M** Watch mins (last 30 days) | **22k** Followers | **1k** Dedications

CSIR-UGC NET

SEE ALL



HINDI MATHEMATICAL SCIENCES

Course on Linear Algebra, Partial Diff. Equation & Calculus

Starts on Mar 1, 2021 • 24 lessons

Gajendra Purohit

HINDI MATHEMATICAL SCIENCES

Course on Complex Analysis & Integral Equation

Starts on Jan 14, 2021 • 16 lessons

Gajendra Purohit

HINDI MATHEMATICAL SCIENCES

Foundation Course on Mathematics for CSIR 2021

Starts on Dec 7, 2020 • 20 lessons

Gajendra Purohit

Educator highlights

- Works at **Pacific Science College**
- Studied at **M.Sc., NET, PhD(Algebra), MBA(Finance), BEd**
- PhD, NET | Plus Educator For CSIR NET | Youtuber (260K+Subs.) | Director Pacific Science College |
- Lives in **Udaipur, Rajasthan, India**
- Unacademy Educator since

FEE DETAILS FOR IIT JAM SUBSCRIPTION

No cost EMI available on 6 months & above subscription plans

24 months	Save 67%	₹ 908 / mo	Total ₹ 21,780	You get 6 months extra for free — Offer expires 15 Jun 2022
12 months	Save 54%	₹ 1,248 / mo	Total ₹ 14,974	You get 6 months extra for free — Offer expires 15 Jun 2022
9 months	Save 45%	₹ 1,497 / mo	Total ₹ 13,475	
6 months	Save 25%	₹ 2,042 / mo	Total ₹ 12,252	
3 months	Save 17%	₹ 2,269 / mo	Total ₹ 6,807	
1 month		₹ 2,723 / mo	Total ₹ 2,723	

To be paid as a one-time payment

Have a referral code?

Proceed to pay

Get 10% Off

After Using My Referral Code

GPSIR

Awesome! You get 10% off

No cost EMI available on 6 months & above subscription plans

24 months	Save 67%	₹ 817 / mo	~~₹ 21,780~~ ₹ 19,602	You get 6 months extra for free — Offer expires 15 Jun 2022
12 months	Save 54%	₹ 1,123 / mo	~~₹ 14,974~~ ₹ 13,477	You get 6 months extra for free — Offer expires 15 Jun 2022
9 months	Save 45%	₹ 1,348 / mo	~~₹ 13,475~~ ₹ 12,128	
6 months	Save 25%	₹ 1,838 / mo	~~₹ 12,252~~ ₹ 11,027	
3 months	Save 17%	₹ 2,042 / mo	~~₹ 6,807~~ ₹ 6,126	

Proceed to pay