Chhatrapati Shahu Ji Maharaj University, Kanpur

Answer Script Details
Barcode 11923648

Roll No. 23081000411
Total Mark 56/75.00

Exam BSC-V_ODD_EXAM_NOV_2025
Subject B030501T - Group and Ring TheoryAndLinear Algebra

Question wise Mark Summary

Q.No	Mark	Q.No	Mark	Q.No	Mark	Q.No	Mark
1A	4/5						
1B	4/5						
1C	4/5						
1D	4/5						
1E	4/5						
1F	4/5						
1G	4/5						
1H	4/5						
1I	4/5						
2	0/15						
3	0/15						
4	10/15						
5	0/15						
6	10/15						
7	0/15						
8	0/15						
9	0/15						

PART-I

Date of Exam : 25/11/25 Shift : II Room No. : 31

Paper Code : B030501T Subject : Maths Year/Sem : Vth

Name of Candidate : Sneha Shukla

Roll No. 2 3 0 8 1 0 0 0 4 1 1

Signature of Candidate: Sneha

Signature of Invigilator

COE Facsimile

Chhatrapati Shahu Ji Maharaj University
Kanpur, Uttar Pradesh

PART-II

MARKS OBTAINED

Q.	1	2	3	4	5	6	7	8	9	10
(a)										
(b)										
(c)										
(d)										
(e)										
(f)										
(g)										
(h)										
(i)										
(j)										
Total										

Total Marks in Figures — Max. Marks

Total Marks in Words

B030501T

Paper Code

Signature of Evaluator

PART-III

Course B.Sc. (maths)

Session 2025-26 Year/Semester Vth

Subject Mathematics

Paper Code: B 0 3 0 5 0 1 T

Exam Date: 2 5 1 1 2 0 2 5

Name of Candidate: S N E H A S H U K L A

Father's Name: A T U L K U M A R

महाविद्यालय का कोड College Code: A U 0 3

परीक्षा केन्द्र का कोड Exam Centre Code: A U 0 3

परीक्षा का प्रकार Type of Exam

संस्थागत Regular ● — भूतपूर्व परीक्षार्थी Ex. Student ○

व्यक्तिगत Private ○ — बैक पेपर परीक्षा Back paper Exam ○

ANSWER BOOKLET NO.

11923648

B030501T

Paper Code

PART-IV

नामांकन संख्या Enrollment Number: C S J M A 2 3 0 0 0 0 0 3 8 5 4

परीक्षार्थी अनुक्रमांक संख्या Candidate's Roll Number: 2 3 0 8 1 0 0 0 4 1 1

पेपर कोड Paper Code: B 0 3 0 5 0 1 T

Sneha

Signature of Candidate

Signature of Invigilator

C S Facsimile

COE Facsimile

नोट : 1. परीक्षार्थी को निर्देशित किया जाता है कि आवरण पन्ने के पृष्ठ भाग पर अंकित सभी निर्देशों को सावधानी पूर्वक पढ़ें।
2. बॉक्स में भरी जाने वाली प्रविष्टियाँ बायीं तरफ से शुरू की जायें। 3. गोलों को काले या नीले बॉलपेन से भरा जायें।

INSTRUCTIONS TO THE CANDIDATE FOR FILLING PART-I

1. Read the instructions carefully given on the answer script and admit card.
2. Write Date of Exam, Shift, Paper Code & Name of Subject Correctly.
3. Write Name & Roll No. Correctly.
4. Write Semester & Branch Correctly.

INSTRUCTIONS TO THE CANDIDATE FOR FILLING PART-III

1. Use blue or black ball point pen for writing alphabets & numerals in ☐ Boxes.
2. Carefully study the example before you start marking.
3. As shown in the example below blacken the circles completely.

Correct method	Incorrect method
① ● ③ ④	

4. Make no Stray marks on this sheet.
5. **DO NOT WRITE OR MARK ON THE BAR CODE.**

परीक्षार्थी के लिए निर्देश

1. प्रवेश पत्र एवं उत्तर पुस्तिका पर दिये गये निर्देशों को ध्यान से पढ़े।
2. कवर पृष्ठ के दूसरी तरफ कुछ न लिखे।
3. उत्तर पुस्तिका के पृष्ठों पर दोनों तरफ लिखें।
4. प्रश्न पत्र पर अपने अनुक्रमांक के अतिरिक्त कुछ न लिखें।
5. प्रश्न पत्र कोड एवं प्रश्न पत्र कोड सावधानी पूर्वक लिखें।
6. अपनी स्थिति स्पष्ट लिखें।
7. उत्तर पुस्तिका के पृष्ठों की संख्या देखें। अगर उत्तर पुस्तिका में पृ (1–24) से कम है या फटे हुए है, तो परीक्षा शुरू होने के पूर्व दूसरी उत्त पुस्तिका ले लें।
8. प्रश्नपत्र को देख, यदि प्रश्नपत्र के विषय कोड, विषय का नाम तथा प्रश्न में कोई त्रुटि है तो उसके परीक्षा शुरू होने के 30 मिनट के अन्दर क निरीक्षक को तत्काल सूचित करें, उसके बाद विश्वविद्यालय द्वारा को कार्यवाही नहीं की जायेगी।
9. प्रश्नों के उत्तर लिखने के लिये पेंसिल का प्रयोग न करें।
10. B कॉपी या अतिरिक्त ग्राफ नहीं दिया जायेगा।

IN ORDER TO AVOID UFM (UNFAIR MEANS) :

1. The Roll No. and Answer Book no. found elsewhere or any other symbol found in the answer book will be treated as unfair means.
2. Any tempering of Bar Code and Booklet no shall be treated as Unfair Means.
3. Do Not bring the materials like slip of paper/mobile/digital diaries/ study material/ revision notes in examination hall. Possession of the mobiles/ digital diaries/ electronic watch and any other electronic gadget except memory less scientific calculator shall be considered as UFM case.
4. Do not keep or paste currency note in answer script it shall be consider as UFM.

INSTRUCTIONS TO THE CANDIDATE

1. Read the instructions carefully given on the Question Pape Admit Card & Answer Script.
2. Do not write anything on back side of the cover page.
3. Write on both sides of pages of answer book.
4. Do not write anything on question paper except Roll Number.
5. Write Paper Code & Question Paper Id carefully.
6. CHECK the number of pages (1-32) or any other kind of damag in your answer script, if found than change the answer scrip immediately before the commencement of examination.
7. CHECK the Question Paper for any kind of discrepancy e.g Subject Code, Subject Name and Question of the Questio Paper during first THIRTY MINUTES of the commencement o the exam, so that it can be corrected in TIME. After that no corrections shall be entertained by the university.
8. Do not use pencil for answering the question.
9. Write status correctly e.g. those appearing in carry over paper should fill in status as Carry Over. Those appearing as E Students should fill in status as ex.
10. No supplementary answer book & graph paper will be provided.

अनुचित साधन से बचने हेतु:

1. उत्तर पुस्तिका के निर्देशित स्थान को छोड़कर अनुक्रमांक एवं उत्तरपुस्तिका का क्रमांक कहीं और न लिखे तथा कोई भी चिन्ह न बनायें क्योंकि यह अनुचित साधन प्रयोग की परिधि में आता है।
2. उत्तर पुस्तिका के बारकोड अथवा उत्तर पुस्तिका संख्या पर छेड़ करने पर अनुचित साधन प्रयोग माना जायेगा।
3. परीक्षा कक्ष में निम्न वस्तुएं साथ न लाये, जैसे लिखे हुए कागज के टुकड़े, मोबाईल, डिजिटल डायरी, कॉपी, पुस्तक यह सभी वस्तुए जो अनुचित साधन के अन्तर्गत आती है। केवल संबंधित प्रश्नपत्र में ही मेमोरी लैस साइंटफिक केल्कुलेटर ले जाने की अनुमन्यता होगी।
4. उत्तर पुस्तिकाओं में रूपये न रखें न ही उत्तर पुस्तिका में चिपकायें। ऐसा करना अनुचित साधन प्रयोग की परिधि में आता है।

INSTRUCTIONS TO THE CANDIDATE FOR FILLING PART-IV

1. Use blue or black ball point pen for writing alphabets & numberals in ☐ Boxes.
2. Use blue or black ball point pen for filling the circles.

	1	8	1	5	4	3	2	1	6	9
⓪	⓪	⓪	⓪	⓪	⓪	⓪	⓪	⓪	⓪	⓪
①	●	①	●	①	①	①	①	●	①	①
②	②	②	②	②	②	②	●	②	②	②
③	③	③	③	③	③	●	③	③	③	③
④	④	④	④	④	●	④	④	④	④	④
⑤	⑤	⑤	⑤	●	⑤	⑤	⑤	⑤	⑤	⑤
⑥	⑥	⑥	⑥	⑥	⑥	⑥	⑥	⑥	●	⑥
⑦	⑦	⑦	⑦	⑦	⑦	⑦	⑦	⑦	⑦	⑦
⑧	⑧	●	⑧	⑧	⑧	⑧	⑧	⑧	⑧	⑧
⑨	⑨	⑨	⑨	⑨	⑨	⑨	⑨	⑨	⑨	●

Note - If your Roll No. is of 10 digits, Please leave first three column

Paper Code 8 0 3 0 5 0 1 T

01

Answer 1 (A)

Find all the automorphisms of the multiplicative group $G = \{1, -1, i, -i\}$ of four fourth roots of unity.

Automorphism –

A function is said that when G is one-one and on-to then we said a function Automorphism.

four fourth roots of unity – $\{a, a^2, a^3, a^4 = e\}$

(I) f(x) is one-one

(II) f(x) is onto

$f(\alpha x + \beta y) = \alpha f(x) + \beta(y)$ a form of Homomorphism.

· group $G = \{1, -1, i, -i\}$ is a multiplicative group G . $\{a, a^2, a^3, a^4 = e\}$

$o(a) = 4$, $o(a^2) = 2$, $o(a^3) = 4$

order of two

X	1	-1	i	-i
1	1	-1	i	-i
-1	-1	1	-i	i
i	i	-1	-1	1
-i	-i	i	1	-1

$f(-i, 1) = -i$
$f(-i, -1) = i$
$f(-i, i) = 1$
$f(-i, -i) = -1$

$f(1,1) = 1$	$f(-1, 1) = -1$	$f(i, 1) = i$
$f(1, 1) = -1$	$f(-1, -1) = 1$	$f(i, -1) = -i$
$f(1, i) = i$	$f(-1, i) = -i$	$f(i, i) = -1$
$f(1, -i) = i$	$f(-1, -i) = i$	$f(i, -i) = 1$

this is called multiplicative group $G = \{1, -1, i, -i\}$ of four fourth roots of unity.

Do Not Write anything in this Portion

Paper Code

B 0 30 5 0 1 T

02

Answer 1 (B)

Show that no group of order 30 is simple.

2 | 30
3 | 15
5 | 5
1

Group of order 30 = { ~~0, 2, 4, 6~~, 8,

{ 0, 2, 3, 5 } mod (5)

No Group of order 30 is simple because the group of order 30 is very other types. then inside of ~~ord~~ group of order 30 is at simple.

Group and ring theory satisfies when the condition are satisfy –

(i) Closure Property
(ii) Associative
(iii) Existence of identity
(iv) Existence of inverse
(v) Commutative law.

that' why Group of order 30 is abelian.
So all group of order 30 is abelian thats we can say that

No group of order 30 is simple.

03

Answer 1(C)

Show that $f(x) = 8x^3 + 6x^2 - 9x + 24$ is irreducible over rational number Q.

Irreducible —

That function $f(x)$ is irreducible if and only if

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

when this is satisfy then $f(x)$ is irreducible over rational number Q.

$8x^3 + 12x^2 - 6x^2$

$7x \; 18x - 24$

$F(x) = 8x^3 + 6x^2 - 9x + 24$ $4x^2(2x+3)$

$= 8x^3 + 8x^2 - 2x^2 + 2$

factor $8x^3 + 6x^2 - 9x + 24 = 0$

$8x^3$ $\quad 8x^3 + 6x^2 - 9x + 24$

$x(8x^2 + 6x - 9) + 24$ $\quad 8x^3 + 8x^2 - 2x - 9x + 24$

$\cancel{x(8x^2 + 12x \; 3(x-3)}$ $\quad 8x^2(x+1) - 2x$

$x(8x^2 + 12x - 6x - 9) + 24$ $\quad 8x^3 + 6x$ $\quad 12 \times 6$

$x(4x(2x+3) - 3(2x+3) + 24$ $\quad 12^2$

$x[(4x-3)(2x+3)] + 24$

$\cancel{x+24}(4x-3)(2x+3)$

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

12 | 72, 2 | 36, 2 | 18, 3 | 9, 3 | 3, 1

9×8

18×4

3×24

$\boxed{f(x) = a(x) \cdot b(x)}$

then we said $f(x) = 8x^3 + 6x^2 - 9x + 24$ is irreducible over rational number Q.

$f(x) = 8x^3 + 6x^2 - 9x + 24$ is factor of $f(x) = a(x) \cdot bx$ that's why $f(x)$ is irreducible over Q

Answer 1 (D)

Define factorisation Domains and Euclidean Domains

Factorisation Domains -

An integral domain ~~R~~ is called a factorisation Domain if the following condition are satisfied -

factorisation Domains is field D over Domain.

factorisation Domains is Integral domain over field D.

$d(a) \geq d(ab)$

factorisation Domains is a other ~~def~~ part of Euclidean Domains.

Euclidean Domains -

An integral domain D is called a Euclidean Domain if the following conditions are satisfied.

acolue. can assign a non negative integer $d(a)$ such that for all $a, b \in R$ with $a \neq 0$, $b \neq 0$ we have

$d(a) < d(ab)$

(ii) $a, b \in R$ with $b \neq 0$

$a = bq + r$, where either $r = 0$

$d(r) < d b$

Euclidean domain by symbol $(D, +, \cdot, d)$

Paper Code

05

Answer 1 (E)

Show that the intersection of two subspaces of a vector space is also a Subspace.

P.T $U_1 \cap U_2 \subseteq V(F)$

let Vector space V(F) is supspace when intersection of two subspaces is subspaces
let

$x \in V(F)$, $x \in U_1$, $\alpha, \beta \in F$

and $y \in V(F)$, $y \in U_2$ $x, y \in U_1$

$x, y \in V(F)$ and $x, y \in U_1 \cap U_2$

supspace $U_1 \cap U_2 \subseteq V(F)$

when

$x \in U_1$ & $y \in U_2$ | $\alpha, \beta \in F \Rightarrow \alpha x + \beta y \in U_1$

$x, y \in U_1 \cap U_2$ | $x, y \in U_2$ &

$\alpha x + \beta y \in U_2$

Ex –

$\alpha x + \beta y \in U_1$, & $\alpha x + \beta y \in U_2$

then we said that

$\alpha x + \beta y \in U_1 \cap U_2 \subseteq V(F)$

'Intersection $U_1 \cap U_2$ of a V(F) is also a supspace.

$U_1 \cap U_2$ is a subspace of V.

'Intersection of two subspaces of a vector space is also a supspace.

Do Not Write anything in this Portion

Paper Code

06

Answer

Show that the set $\{(2,-1,0), (3,5,1), (1,1,2)\}$ forms a basis of $V_3(R)$

Basis forms a basis of $V_3(R)$ satisfied when conditions are applied

(i) S is linearly independent. $|A| \neq 0$
(ii) set is linearly functional &
$L(S) = V(R)$
linearly transform.

$F(x) = \alpha_1 x_1 + \alpha_2 x_2 + 0 \ldots \alpha_n x_n = \{0,0,0\}$

$2\alpha_1 - \alpha_2 + 0\alpha_3 = 0$
$3\alpha_1 + 5\alpha_2 + \alpha_3 = 0$
$\alpha_1 + \alpha_2 + 2\alpha_3 = 0$

$$\begin{vmatrix} 2 & -1 & 0 \\ 3 & 5 & 1 \\ 1 & 1 & 2 \end{vmatrix} \neq 0$$

$= 2(10-1) + 1(6-1) \neq 0$
$18 + 5 \neq 0$
$23 \neq 0$

$|A| \neq 0$

function is linearly independent & linearly transform

$F(x,y,z) = \alpha_1(x_1, y_1, z_1) + \alpha_2(x_2, y_2, z_2) + \alpha_3(x_3, y_3, z_3)$
=

set $\{(2,-1,0), (3,5,1), (1,1,2)\}$ forms a basis of $V_3(R)$.

Paper Code

07

Answer 1 (G)

State and prove the Bessel's inequality.

Bessel's Inequality — Bessel's inequality is theorem of laplace transform. This topic is taken by IVth semester.

Laplace & Fourier transform is the topic of IVth sem.

Basis of V3(R) — Basis is said that if function s is linearly independent and form of linearly transformation is called Basis.

Natural Basis — {(1,0,0), (0,1,0), (0,0,1)}

this is the natural Basis of Bassel's inequality

$$T(\alpha x+\beta y) = \alpha T(x) + \beta T(y)$$
$$f(\alpha x+\beta y) = \alpha f(x) + \beta f(y)$$

$$|A| \neq 0, \quad (\alpha_1 = 0, \ \alpha_2 = 0, \ \alpha_3 = 0)$$

In this transform we can say that Bessel's inequality is not a topic of Vth sem. that's why I wrote Basis of V3(R)

Anser 1 (#)

If T is a linear operator on a vector space V such that $T^2 - T + I = \hat{0}$, then show that T is invertible.

$T^2 - T + I = \hat{0}$
$T^2 = T - I$
$T^2(\alpha) - (T^2 - I)\alpha_i$
$T\,T(\alpha_i) - T(\alpha_i = 0$

$\gamma_i = \beta_i - \alpha_i$
$T(\beta_i = \gamma_i \in V$
Show that T is one-one

$T(\alpha_1) = T(\alpha_2)$
$\beta_1 = \beta_2$
$T(\beta_1) = T(\beta_2) \Rightarrow \gamma = \gamma_2$
$\beta_1 - \alpha_1 = \beta_2 - \alpha_2$
$\beta_1 - \beta_2 = \alpha_2 - \alpha_1$
$0 = \alpha_2 - \alpha_1$
Since $\beta_1 = \beta_2$
$\alpha_1 = \alpha_2$
T is one-one
for each $\beta_i \in V$ there Exist $\beta_i - \alpha_i \in V$
as T is one-one so for $\beta \in V$
$\gamma \in V$
Thus T being one-one and onto is invertible.

Paper Code

09

Answer 1(I)

find the dual basis of the basis set

$B = \{(1,-1,3), (0,1,-1), (0,3,-2)\}$ for V_3R

$\alpha_1 = (1,-1,3)$
$\alpha_2 = (0,1,-1)$
$\alpha_3 = (0,3,-2)$

$f_1(a,b,c) = a_1 a + a_2 b + a_3 c$
$f_2(a,b,c) = b_1 a + b_2 b + b_3 c$
$f_3(a,b,c) = c_1 a + c_2 b + c_3 c$

by theorem $f_i \alpha_j = 0, \; i \neq j$
$\qquad\qquad\qquad\quad 1, \; i = j$

$f_1\alpha_1 = 1$, $f_1\alpha_2 = 0$, $f_1\alpha_3 = 0$
$f_2\alpha_1 = 0$, $f_2\alpha_2 = 1$, $f_2\alpha_3 = 0$
$f_3\alpha_1 = 0$, $f_3\alpha_2 = 0$, $f_3\alpha_3 = 1$

$f_1(a,b,c) \rightarrow$
$f_1(1,-1,3) = 1$
$f_1(0,1,-1) = 0$
$f_1(0,3,-2) = 0$

$= a_1 - a_2 + 3a_3 = 1$
$0 + a_2 - a_3 = 0$
$0 + 3a_2 - 2a_3 = 0$

$3a_2 - 2a_3 = 0$
$2(a_2 - a_3 = 0)$
$3a_2 - 2a_3 = 0$
$-2a_2 - 2a_3 = 0$ $= a_2 = 0, \; a_3 = 0$

Do Not Write anything in this Portion

Paper Code

$a_1 = 1$

$f(1, 0, 0) = \quad = a$

$f_2(a, b, c) -$

~~$f_2 \alpha_1 = a_1$~~

$b_1 - b_2 + 3b_3 = 0$

$0 + b_2 - b_3 = 1$

$0 + 3b_2 - 2b_3 = 0$

$2(b_2 - b_3 = 1)$

$3b_2 - 2b_3 = 0$

$2b_2 - 2b_3 = 2$

$3b_2 - 2b_3 = 0$

$= \quad -b_2 = 2$

$b_2 = -2$

$-2 - b_3 = 1$

$-2 - 1 = b_3$

$b_3 = -3$

$b_1 + 2 - 9 = 0$

$b_1 = -7$

$f_2(a, b, c) = -7, -2, -3$

$f_3(a, b, c) -$

$c_1 - c_2 + 3c_3 = 0$

$0 + c_2 - c_3 = 0$

$0 + 3c_2 - 2c_3 = 1$

$= \quad c_2 = c_3$

$3c_2 - 2c_2 = 1$

$c_2 = 1, \quad c_3 = 1$

$c_1 - 1 + 3 = 0$

$c_1 = -2$

$f_3(a,b,c) = -2, 1, 1$

$f_1(a,b,c) = a$
$f_2(a,b,c) = -7a-2b-3c$
$f_3(a,b,c) = -2a+b+c$

$B^* = (f_1, f_2, f_3)$ is dual basis of (V_3, R)

$f_1(a,b,c)$, $f_2(a,b,c)$, $f_3(a,b,c)$
dual basis.

Paper Code

Section B

(4) $\dim(W_1 + W_2) = \dim W_1 + \dim W_2 - \dim(W_1 \cap W_2)$
if W_1 and W_2 are two subspace of
a finite - dimensional vector space V -

W_1 and W_2 are two subspace of
a finite dimensional vector space V
then

$f(x) \in V(R),$

$x \in W_1$ & $y_2 \in W_2$

$x \in \dim W_1$, $y \in \dim W_2$

When $\dim W_1 \cap W_2$ then $x, y \in V(R)$
and $x, y \in \dim W_1 \cap W_2$

$V = W_1 + W_2$
domain addition

$\forall \oplus V = W_1 \oplus W_2$

$\dim V = \dim(W_1 + W_2)$

$\dim W_1 \in V(R)$. $\dim W_2 \in V(R)$

$0 \in W_1$ & $0 \in W_2$

$0 \in V(R)$

$0 \in W_1 \cap W_2$

W_1 and $W_2 \subseteq V(R)$

$\alpha x + \beta y \in W_1$

$\alpha x + \beta y \in W_2$

$x, y \in W_1 + W_2$

$T(\alpha x + \beta y) \in W_1 + W_2$

Do Not Write anything in this Portion

Paper Code

13

Vector space V (V(R)) intersection of two subspaces.

$\dim W_1 \cap W_2$ ... R)

is

$\dim W_1 \subset V(R)$

$\dim W_2 \subset V(R)$

by theorem

$\dim(W_1 + W_2) \in 0 \in f(R)$

$\cdot \dim(W_1 + W_2) = \dim W_1 + \dim W_2 - \cancel{\dim W_1} \cap W_2$

because by the theorem of intersection $W_1 \cap W_2$ is also a subspace of finite dime- vector space V. then $\dim W_1 \cap W_2 \in 0$ we can said that -

$\dim(W_1 + W_2) = \dim W_1 + \dim W_2 - \dim W_1 \cap W_2$

$\dim W_1 = 0$, $\dim W_2 = 0$, $\dim W_1 \cap W_2 = 0$

$\dim(W_1 + W_2) = \dim W_1 + \dim W_2 - \dim(W_1 \cap W_2)$

Hence prove -

We can say that if W_1 and W_2 are two subspace of a finite - dimensional vector space V than -

$$\boxed{\dim(W_1 + W_2) = \dim W_1 + \dim W_2 - \dim(W_1 \cap W_2)}$$

Section - c

Apply Gram - Schmidt process to the vectors $y_1 = (1, 0, 1)$, $y_2 = (1, 0, -1)$ and $y_3 = (0, 3, 4)$ to obtain an orthonomal basis for $V_3(R)$ with the standard inner product.

$$T(\alpha x + \beta y) = \alpha T(x) + \beta T(y)$$

~~T(1,0,1~~

Inner product

Do Not Write anything in this Portion

Paper Code

Section (C)

Answer - 6

The set $R[x]$ of all polynomials over an arbitary ring R forms a ring with respect to addition and multipli cation of polynomials -

Polynomial ring -
the polynomial ring is said that set $R(x)$ is Associative, Existence of identity Existence of Inverse, commutative ring, scalar multiplication, Distributive law, extra.
An arbitary ring R forms a ring with respect to addition and multipli cation of polynomial.

An arbitory ring R forms a ring with respect to addition of polynomial.

P.T. $f(x) + g(x)$ is polynomial of addition.

$f(x) = ax^2 + bx + c$
$g(x) = a_2x^2 + b_2x + c_2$

$f(x) = g(x)$
$a_1x^2 + b_1x + c_1 = a_2x^2 + b_2x + c_2$
$f(x) + g(x) =$ polynomial Ring.

The set $R(x)$ of all polynomials over an arbitary ring R forms a ring with respect to multiplication of polynomials

$f(x) \cdot g(x)$ = polynomial ring.

$f(x) = a_1x^3 + b_1 x + c_1$
$g(x) = a_2x^2 + b_2 x + c_2$

with respect to multiplication of polynomials.

$f(x) \cdot g(x)$ is polynomoials ~~wit~~ an arbitary ring R forms a ring with respect to multiplication of polynomial.

Polynomial Ring allows the set $R[x]$ of all polynomial –

(i) Associative
(ii) Existence of identity
(iii) Existence of inverse
(iv) Commutative Ring
(v) Scalar multiplication.
(vi) Associative with respect to multiplication.
(vii) Distributive Law
(viii) Existence of inverse with respect to multiplication

Set $R[x]$ of all polynomial over an arbitary ring R forms a ring with respect to addition
$f(x)$ and $g(x)$ are two set $R(x)$
$f(x) + g(x)$ is polynomial

P.T.O.

Do Not Write anything in this Portion

The set $R(x]$ of all polynomials over an arbitary ring R forms a ring with respect to multiplication of polynomials.
Here $f(x)$ and $g(x)$ are two set $R(x]$ is polynomial when $f(x) \cdot g(x)$ is satisfy–

$$\cancel{f(x) = x^{-1}(a)x} - a$$

$f(x)$ and $g(x)$ addition are ~~totally~~ satisfy in over set of $R(x]$ when we let $f(x)$ is follows all condition of polynomial ring & $g(x)$ is also satisfy polynomial ring.

Reminder thearem–
If the $f(x), g(x)$ and $r(x) \in$ polynomial ring then $(x-a)$ is remin...

$$f(x) = q(x) + q(x) \cdot (x-a)$$
$$x = a$$
$$f(a) = q(a) + q(x) \cdot 0$$
$$\underline{f(a) = 0}$$

Paper Code

Do Not Write anything in this Portion

Paper Code

20

Do Not Write anything in this Portion

Do Not Write anything in this Portion

Paper Code

21

Do Not Write anything in this Portion

Paper Code

Paper Code

23

Do Not Write anything in this Portion

Paper Code