OSDAV Public School, Kaithal

Second Unit Test (July, 2024)

Class : XII **Set A**

Subject : Mathematics (Applied)

Time: 1½ hr. **M.M. : 40**

General Instructions:-

All questions are compulsory.

(a) There are 21 questions in this question paper.

(b) SECTION A consists of 10 Multiple Choice questions.

(c) SECTION B consists of 7 questions carrying 2 marks each.

(d) SECTION C consists of 2 questions carrying 3 marks each.

(e) SECTION consists of 2 questions carrying 5 marks each.

Section A

1. If A and B are symmetric matrices of same order than AB – BA is:

   a. symmetric b. skew symmetric

   c. diagonal matrix d. none of these

2. Total number of possible matrices of order 2 x 3 with each entry 0 or 1 is __?

   a. 6 b. 36 c. 32 d. 64

3. If A is square matrix of order 3 such that |adj.A| = 64, then |A| is equal to:

   a. ± 9 b. ± 8 c. ± 18 d. ± 10

4. If A is a square matrix and |A| = 2, then the value of |AA′| where A′ is the transpose of A is equal to:

   a. 1 b. 2 c. 3 d. 4

5. If = $\begin{vmatrix} 2x & -1 \\ 4 & 2 \end{vmatrix} = \begin{vmatrix} 3 & 0 \\ 2 & 1 \end{vmatrix}$, then the value of x is:

   a. $\frac{1}{4}$ b. $-\frac{1}{4}$ c. $\frac{1}{2}$ d. $-\frac{1}{2}$

6. If A is a square matrix of order 3x 3 such that |A| = 4, then |3A| is equal to:

   a. 27 b. 81 c. 108 d. 256

7. If $f'(x) = 3x^3 - x^2$, then f(x) is increasing in the interval:

   a. $\left(\frac{1}{3}, \infty\right)$ b. $\left(-\infty, \frac{1}{3}\right)$ c. $\left(0, \frac{1}{3}\right)$ d. None of these

8. If x + y = 8, then the maximum value of xy is :

   a. 12 b. 16 c. 20 d. 24

9. Slope of normal to the following curve $y = x^3 - x + 1$ at x = 2 is:

   a. -11 b. $-\frac{1}{11}$ c. 11 d. $\frac{1}{11}$

10. If x = at^2 y = 2at then $\frac{d^2y}{dx^2}$ is equal to:

a. $\frac{-1}{2at^3}$ b. $\frac{-1}{2at^2}$ c. $\frac{s1}{2at^3}$ d. 0

Section B

11. If the matrix $\begin{bmatrix} 0 & a & 3 \\ 2 & b & -1 \\ c & 1 & 0 \end{bmatrix}$ is skew symmetric, find the value of a, b and c.

12. Express the following matrix as sum of a symmetric and skew symmetric matrix:

$\begin{bmatrix} 3 & -4 \\ 1 & -1 \end{bmatrix}$

13. If y = $ae^{mx} + be^{-mx}$ prove that $\frac{d^2y}{dx^2}$ - m^2y = 0

14. Find the value of k if the area of the triangle is 35 sq. units with the vertices (k, 4), (2, -6) and (5, 4)

15. If A = $\begin{bmatrix} 3 & 5 \\ 7 & -11 \end{bmatrix}$ verify that $A^{-1} A = I_2$

16. Solve the following equation using cramer's rule:

2x + 3y = 1

5x + 7y = 2

17. Find the point on the curve y = x^3 – 11x+5 at which the tangent has the equation y= x – 11.

Section C

18. Determine the interval on which the following function is strictly increasing or strictly decreasing: $2x^3 - 9x^2 + 12x + 30$.

19. Prove that $\begin{vmatrix} 1 & b+c & b^2+c^2 \\ 1 & c+a & c^2+a^2 \\ 1 & a+b & a^2+b^2 \end{vmatrix}$ = (a – b) (b – c))c – a)

Section D

20. If A = $\begin{bmatrix} 3 & 1 & 2 \\ 3 & 2 & -3 \\ 2 & 0 & -1 \end{bmatrix}$ Find A^{-1}

Hence solve the system of equations:

3x + 3y + 2z = 1

x + 2y = 4

2x – 3y – z = 5

21. If 40 sq. feet of sheet metal are to be used in the construction of an open tank with a square base, find the dimensions for maximum volume.

OSDAV Public School, Kaithal
Second Unit Test (July, 2024)
Class : XII   Set B
Subject : Mathematics (Applied)

Time: 1½ hr.   **M.M. : 40**

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(b) SECTION A consists of 10 Multiple Choice questions.
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(d) SECTION C consists of 2 questions carrying 3 marks each.
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Section A

1. If A is a square matrix such that $A^2 = A$, then $(I + A)^2 - 3A$ is equal to:
   a. I b. 2A c. 3I d. A
2. If $\begin{bmatrix} 2x+y & 4x \\ 5x-7 & 4x \end{bmatrix} = \begin{bmatrix} 7 & 7y-13 \\ y & x+6 \end{bmatrix}$, then values of x and y are:
   a. x = 3, y = 1 b. x = 2, y = 3 c. x = 2, y = 6 d. x = 3, y = 3
3. If A is a square matrix of order 3 x 3, then value f |3A| is equal t:
   a. 3|A| b. 9|A| c. 27|A| d. none of these
4. If A = $\begin{bmatrix} 1 & 2 \\ 3 & -1 \end{bmatrix}$ and B = $\begin{bmatrix} 1 & 3 \\ -1 & 1 \end{bmatrix}$, then the value of |AB| is:
   a. 28 b. -28 c. 56 d. -56
5. If = $\begin{vmatrix} 2x & -1 \\ 4 & 2 \end{vmatrix} = \begin{vmatrix} 3 & 0 \\ 2 & 1 \end{vmatrix}$, then the value of x is:
   a. $\frac{1}{4}$ b. $-\frac{1}{4}$ c. $\frac{1}{2}$ d. $-\frac{1}{2}$
6. If A is a square matrix of order 3x 3 such that |A| = 4, then |adj A| is equal to:
   a. 16 b. 81 c. 108 d. 256
7. If $f'(x) = 3x^3 - x^2$, then f(x) is increasing in the interval:
   a. $\left(\frac{1}{3}, \infty\right)$ b. $\left(-\infty, \frac{1}{3}\right)$ c. $\left(0, \frac{1}{3}\right)$ d. None of these
8. If x + y = 8, then the maximum value of xy is :
   a. 12 b. 16 c. 20 d. 24
9. Slope of normal to the following curve $y = x^3 - x + 1$ at x = 2 is:
   a. -11 b. - $\frac{1}{11}$ c. 11 d. $\frac{1}{11}$
10. If $x = at^2$ $y = 2at$ then $\frac{d^2y}{dx^2}$ is equal to:
    a. $\frac{-1}{2at^3}$ b. $\frac{-1}{2at^2}$ c. $\frac{1}{2at^3}$ d. 0

Section B

11. Find the value of x, y z if the matrix A = $\begin{bmatrix} 0 & 2y & z \\ x & y & -z \\ x & -y & z \end{bmatrix}$ satisfies the law A '

A = I

12. Express the following matrix as sum of a symmetric and skew symmetric matrix:

$\begin{bmatrix} 4 & 2 \\ 3 & 5 \end{bmatrix}$

13. If y = $ae^{mx} + be^{-mx}$ prove that $\frac{d^2y}{dx^2}$ - m^2y = 0

14. Find the value of k if the area of the triangle is 35 sq. units with the vertices (k, 4), (2, -6) and (5, 4)

15. If A = $\begin{bmatrix} 2 & 3 \\ 3 & 5 \end{bmatrix}$ verify that A^{-1} A = I_2

16. Solve the following equation using cramer's rule:

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Section C

18. Determine the interval on which the following function is strictly increasing or strictly decreasing: $4x^3 - 6x^2 - 72x + 30$.

19. Prove that $\begin{vmatrix} 1 & b+c & b^2+c^2 \\ 1 & c+a & c^2+a^2 \\ 1 & a+b & a^2+b^2 \end{vmatrix}$ = (a – b) (b – c))c – a)

Section D

20. If 40 sq. feet of sheet metal are to be used in the construction of an open tank with a square base, find the dimensions for maximum volume.

21. 20. If A = $\begin{bmatrix} 3 & 1 & 2 \\ 3 & 2 & -3 \\ 2 & 0 & -1 \end{bmatrix}$ Find A^{-1}

Hence solve the system of equations:

$3x + 3y + 2z = 1$
$x + 2y = 4$
$2x - 3y - z = 5$

July Unit Test

Class :- XII

Mathematics (Applied)

Marking Scheme / Hints to Solutions

Note :- Any other relevant answer not given here in but given by the students, be suitably awarded.

Q. No.	Value points / Key points	Marks alloted to each Key point	Total points
1	(b) Skew Symmetric	1	1
2	(d) 64	1	1
3	(b) ± 8	1	1
4	(d) 4	1	1
5 5(B)	(b) $-\frac{1}{4}$	1	1
6 6(B)	(c) 108	1	1
7 7(B)	(a) $\left(\frac{1}{3}, \infty\right)$	1	1
8 8(B)	(b) 16	1	1
9 9(B)	(b) $-\frac{1}{11}$	1	1
10 10(B)	(a) $-\frac{1}{2at^3}$	1	1

Section B

11 let $A = \begin{bmatrix} 0 & a & 3 \\ 2 & b & -1 \\ c & 1 & 0 \end{bmatrix}$

A is skew symmetric 1/2

$\therefore A' = -A$

$$\begin{bmatrix} 0 & 2 & c \\ a & b & 1 \\ 3 & -1 & 0 \end{bmatrix} = \begin{bmatrix} 0 & -a & -3 \\ -2 & -b & 1 \\ -c & -1 & 0 \end{bmatrix}$$ 1 2

$-a = 2$ $\boxed{c = -3}$ $b = -b$

$\boxed{a = -2}$ $b + b = 0$ 1/2

$2b = 0$

$\boxed{b = 0}$

12 let $A = \begin{bmatrix} 3 & -4 \\ 1 & -1 \end{bmatrix}$

$A' = \begin{bmatrix} 3 & 1 \\ -4 & -1 \end{bmatrix}$ 1/2

$\frac{1}{2}(A + A') = \frac{1}{2}\begin{bmatrix} 6 & -3 \\ -3 & -2 \end{bmatrix} = \begin{bmatrix} 3 & -3/2 \\ -3/2 & -1 \end{bmatrix}$ 1/2 2

$\frac{1}{2}(A - A') = \frac{1}{2}\begin{bmatrix} 0 & -5 \\ 5 & 0 \end{bmatrix} = \begin{bmatrix} 0 & -5/2 \\ 5/2 & 0 \end{bmatrix}$ 1/2

$\begin{bmatrix} 3 & -4 \\ 1 & -1 \end{bmatrix} = \begin{bmatrix} 3 & -3/2 \\ -3/2 & -1 \end{bmatrix} + \begin{bmatrix} 0 & -5/2 \\ 5/2 & 0 \end{bmatrix}$ 1/2

13	$y = ae^{mx} + be^{-mx}$		
13(B)	$\frac{dy}{dx} = ame^{mx} - bme^{-mx}$	1/2	
	$\frac{d^2y}{dx^2} = am^2e^{mx} + bm^2e^{-mx}$	1/2	
	$= m^2[ae^{mx} + be^{-mx}]$		2
	$= m^2 y$	1/2	
	$\frac{d^2y}{dx^2} - m^2 y = 0$	1/2	
14	Let. $A(k,4)$ $B(2,-6)$ $C(5,4)$		
14(B)	Area of $\Delta ABC = \frac{1}{2}\begin{vmatrix} k & 4 & 1 \\ 2 & -6 & 1 \\ 5 & 4 & 1 \end{vmatrix} = 35$	1/2	
	$\frac{1}{2}\lvert k(-6-4) - 4(2-5) + 1(8+30)\rvert = 35$		
	$\frac{1}{2}\lvert -10k + 12 + 38 \rvert = 35$	1/2	2
	$-10k + 50 = \pm 70$		
	$-10k = 70 - 50$ $-10k = 20$ $k = -2$ $-10k = -70 - 50$ $\cancel{-}1\cancel{0}k = \cancel{-}12\cancel{0}$ $k = 12$	$\frac{1}{2} + \frac{1}{2}$	
15	$A = \begin{bmatrix} 3 & 5 \\ 7 & -11 \end{bmatrix}$ $\quad \lvert A \rvert = -33 - 35 = -68$	1/2	
	adj $A = \begin{bmatrix} -11 & -7 \\ -5 & 3 \end{bmatrix}' = \begin{bmatrix} -11 & -5 \\ -7 & 3 \end{bmatrix}$	1/2	

$A^{-1} = -\frac{1}{68}\begin{bmatrix} -11 & -5 \\ -7 & 3 \end{bmatrix}$

$A^{-1}A = -\frac{1}{68}\begin{bmatrix} -11 & -5 \\ -7 & 3 \end{bmatrix}\begin{bmatrix} 3 & 5 \\ 7 & -11 \end{bmatrix}$ 1/2

$= -\frac{1}{68}\begin{bmatrix} -33-35 & -55+55 \\ -21+21 & -35-33 \end{bmatrix}$ 2

$= -\frac{1}{68}\begin{bmatrix} -68 & 0 \\ 0 & -68 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ 1/2

$= I_2$

16 $2x+3y=1$

16(B) $5x+7y=2$

$D = \begin{vmatrix} 2 & 3 \\ 5 & 7 \end{vmatrix} = 14-15 = -1 \neq 0$ 1/2

$D_2 = \begin{vmatrix} 2 & 1 \\ 5 & 2 \end{vmatrix}$ $D_1 = \begin{vmatrix} 1 & 3 \\ 2 & 7 \end{vmatrix}$ 1/2+1/2 2

$= 4-5 = -1$ $= 7-6 = 1$

$x = x_1 = \frac{D_1}{D} = \frac{1}{-1} = -1$ $y = x_2 = \frac{D_2}{D} = \frac{\cancel{-}1}{\cancel{-}1}$ 1/2

$= 1$

$x = -1, \ y = 1$

17 $y = x^3 - 11x + 5$

$\frac{dy}{dx} = 3x^2 - 11$ = Slope of tangent lines 1/2

17(B) eq^n of tangent line :- $x - y - 11 = 0$

Slope $= \frac{+1}{+1} = 1$ 1/2

$3x^2 - 11 = 1$

$3x^2 = 12$ 2

$x^2 = 4$ 1/2

$x = \pm 2$

Req. points :- $(2, 8-22+5)$, $(-2, -8+22+5)$

$(2, -9)$ $(-2, 19)$ 1/2

Section C

18 $f(x) = 2x^3 - 9x^2 + 12x + 30$

$f'(x) = 6x^2 - 18x + 12$ 1/2

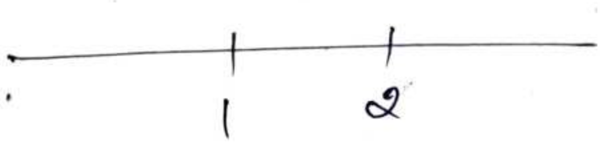
$= 6(x^2 - 3x + 2)$

$= 6(x^2 - 2x - x + 2)$

$= 6(x-2)(x-1)$

for c.v. 1/2.

$f'(x) = 0$ $x = 2, 1$



Case (i) $x < 1$

$f'(x) = (+ve)(-ve)(-ve) = +ve$ 1/2

$\therefore$ in $(-\infty, 1)$ $f(x)$ is st $\uparrow$

Case (ii) $1 < x < 2$

$f'(x) = (+ve)(-ve)(+ve) = -ve$ 1/2

$\therefore$ in $(1,2)$ $f(x)$ is st $\downarrow$

Case (iii) $x > 2$

$f'(x) = (+ve)(+ve)(+ve) = +ve$ 1/2 3

$\therefore$ in $(2,\infty)$ $f(x)$ is st $\uparrow$

$(-\infty, 1) \cup (2,\infty)$ st $\uparrow$ 1/2

$(1,2)$ st $\downarrow$

19

19(B)

$$\begin{vmatrix} 1 & b+c & b^2+c^2 \\ 1 & c+a & c^2+a^2 \\ 1 & a+b & a^2+b^2 \end{vmatrix} = (a-b)(b-c)(c-a)$$

L.H.S

$R_1 \to R_1 - R_2$ & $R_2 \to R_2 - R_3$

$$\begin{vmatrix} 0 & b-a & b^2-a^2 \\ 0 & c-b & c^2-b^2 \\ 1 & a+b & a^2+b^2 \end{vmatrix}$$ 1

$$(a-b)(b-c)\begin{vmatrix} 0 & -1 & -(a+b) \\ 0 & -1 & -(b+c) \\ 1 & a+b & a^2+b^2 \end{vmatrix}$$ 1/2

$R_1 \to R_1 - R_2$

$$(a-b)(b-c)\begin{vmatrix} 0 & 0 & c-a \\ 0 & -1 & -(b+c) \\ 1 & a+b & a^2+b^2 \end{vmatrix}$$ 1/2

$$(a-b)(b-c)(c-a)\begin{vmatrix} 0 & 0 & 1 \\ 0 & -1 & -(b+c) \\ 1 & a+b & a^2+b^2 \end{vmatrix}$$ 1/2 | 3

$$(a-b)(b-c)(c-a)\left[1(0+1)\right]$$

$$(a-b)(b-c)(c-a)$$ 1/2

20

21(B)

$$A = \begin{bmatrix} 3 & 1 & 2 \\ 3 & 2 & -3 \\ 2 & 0 & -1 \end{bmatrix}$$

$$|A| = 3(-2) - 1(-3+6) + 2(-4)$$ 1/2

$$= -6 - 3 - 8 = -17$$

$$\text{adj}A = \begin{bmatrix} -2 & -3 & -4 \\ +1 & -7 & +2 \\ -7 & +15 & 3 \end{bmatrix}'$$

$$= \begin{bmatrix} -2 & 1 & -7 \\ -3 & -7 & 15 \\ -4 & 2 & 3 \end{bmatrix}$$ 1

$$A^{-1} = -\frac{1}{17}\begin{bmatrix} -2 & 1 & -7 \\ -3 & -7 & 15 \\ -4 & 2 & 3 \end{bmatrix}$$ 1/2

$$3x + 3y + 2z = 1$$

$$x + 2y = 4$$

$$2x - 3y - z = 5$$

$$\begin{bmatrix} 3 & 3 & 2 \\ 1 & 2 & 0 \\ 2 & -3 & -1 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 1 \\ 4 \\ 5 \end{bmatrix}$$ 1/2

which is of the form

$$A'X = B$$ 1/2

$$X = (A')^{-1} B$$ 1/2

$$X = (A^{-1})' B$$

$$X = \frac{-1}{17} \begin{bmatrix} -2 & -3 & -4 \\ 1 & -7 & 2 \\ -7 & 15 & 3 \end{bmatrix} \begin{bmatrix} 1 \\ 4 \\ 5 \end{bmatrix}$$ 1/2

$$= -\frac{1}{17} \begin{bmatrix} -2-12-20 \\ 1-28+10 \\ -7+60+15 \end{bmatrix}$$ 1/2   5

$$\begin{bmatrix} x \\ y \\ z \end{bmatrix} = -\frac{1}{17} \begin{bmatrix} -34 \\ -17 \\ 68 \end{bmatrix} = \begin{bmatrix} 2 \\ 1 \\ -4 \end{bmatrix}$$

$\therefore x = 2,\ y = 1,\ z = -4$ 1/2

21 let length of box = x feet
then breadth " " = x feet [∵ base is square]
20(B) let height " " = y feet

$$V = x \times x \times y$$ 1/2

$$V = x^2 y$$

Area of box = $lb + 2(bh + hl)$

$$= x^2 + 2(xy + xy)$$

$$= x^2 + 4xy = 40 \text{ [A.T.Q]}$$ 1

$$4xy = 40 - x^2$$

$$y = \frac{40 - x^2}{4x}$$ 1/2

$$V = x^{\cancel{2}}\left[\frac{40 - x^2}{4\cancel{x}}\right] = \frac{40x - x^3}{4}$$ 1/2

$$\frac{dV}{dx} = \frac{40 - 3x^2}{4} = 0$$

$$40 - 3x^2 = 0$$

$$40 = 3x^2$$

$$x^2 = \frac{40}{3} \Rightarrow x = \sqrt{\frac{40}{3}}$$ 1/2

$$\frac{d^2V}{dx^2} = -\frac{6x}{4} \text{ is -ve if } x = \sqrt{\frac{40}{3}}$$

$\therefore x = \sqrt{\frac{40}{3}}$ is the point of maxima 1

$$y = \frac{40 - \frac{40}{3}}{4 \times \sqrt{\frac{40}{3}}} = \frac{\overset{20}{\cancel{80}}}{3\sqrt{3}} \times \frac{\sqrt{3}}{\cancel{4} \times \sqrt{40}} = \frac{\overset{\sqrt{20}}{\cancel{20}}}{\sqrt{3}\sqrt{\cancel{10}}\sqrt{2}} = \frac{\sqrt{20}}{\sqrt{6}} \times \frac{\sqrt{6}}{\sqrt{6}}$$

$$y = \sqrt{\frac{\cancel{20}10}{\cancel{6}3}} = \sqrt{\frac{10}{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{\sqrt{30}}{3}$$

$$x = \sqrt{\frac{40}{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{\sqrt{120}}{3}$$ 1 5

Extra Questions of Set B

1	(a) I	1	1
2	(b) $x=2,\ y=3$	1	1
3	(c) $27\|A\|$	1	1
4	(b) -28	1	1

11

$$A = \begin{bmatrix} 0 & 2y & z \\ x & y & -z \\ x & -y & z \end{bmatrix}$$

$$A' = \begin{bmatrix} 0 & x & x \\ 2y & y & -y \\ z & -z & z \end{bmatrix}$$ 1/2

$$A'A = I$$

$$\begin{bmatrix} 0 & x & x \\ 2y & y & -y \\ z & -z & z \end{bmatrix} \begin{bmatrix} 0 & 2y & z \\ x & y & -z \\ x & -y & z \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

$$\begin{bmatrix} x^2+x^2 & xy-xy & -xz+xz \\ 0+xy-xy & 4y^2+y^2+y^2 & 2yz-yz-yz \\ -xz+xz & 2yz-yz-yz & z^2+z^2+z^2 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$ 1

$$\begin{bmatrix} 2x^2 & 0 & 0 \\ 0 & 6y^2 & 0 \\ 0 & 0 & 3z^2 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$ 2

$2x^2 = 1 \qquad 6y^2 = 1 \qquad 3z^2 = 1$

$x^2 = \frac{1}{2} \qquad y^2 = \frac{1}{6} \qquad z^2 = \frac{1}{3}$ 1/2

$x = \pm\frac{1}{\sqrt{2}} \qquad y = \pm\frac{1}{\sqrt{6}} \qquad z = \pm\frac{1}{\sqrt{3}}$

12 (a) $A = \begin{bmatrix} 4 & 2 \\ 3 & 5 \end{bmatrix} \qquad A' = \begin{bmatrix} 4 & 3 \\ 2 & 5 \end{bmatrix}$ 1/2

$\frac{1}{2}(A+A') = \frac{1}{2}\begin{bmatrix} 8 & 5 \\ 5 & 10 \end{bmatrix} = \begin{bmatrix} 4 & 5/2 \\ 5/2 & 5 \end{bmatrix}$ 1/2

$\frac{1}{2}(A-A') = \frac{1}{2}\begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix} = \begin{bmatrix} 0 & -1/2 \\ 1/2 & 0 \end{bmatrix}$ 1/2 2

$\begin{bmatrix} 4 & 2 \\ 3 & 5 \end{bmatrix} = \begin{bmatrix} 4 & 5/2 \\ 5/2 & 5 \end{bmatrix} + \begin{bmatrix} 0 & -1/2 \\ 1/2 & 0 \end{bmatrix}$ 1/2

15 $A = \begin{bmatrix} 2 & 3 \\ 3 & 5 \end{bmatrix}$ 1/2

$|A| = 10 - 9 = 1$

$\text{adj}A = \begin{bmatrix} 5 & -3 \\ -3 & 2 \end{bmatrix}^{9} = \begin{bmatrix} 5 & -3 \\ -3 & 2 \end{bmatrix}$ 1/2

$A^{-1} = \frac{1}{1}\begin{bmatrix} 5 & -3 \\ -3 & 2 \end{bmatrix}$ 1/2

2

$A^{-1}A = \begin{bmatrix} 5 & -3 \\ -3 & 2 \end{bmatrix}\begin{bmatrix} 2 & 3 \\ 3 & 5 \end{bmatrix}$

$= \begin{bmatrix} 10-9 & 15-15 \\ -6+6 & -9+10 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ 1/2

$= I_2$

18 $f(x) = 4x^3 - 6x^2 - 72x + 30$

$f'(x) = 12x^2 - 12x - 72$ 1/2

$= 12[x^2 - x - 6]$

$= 12[x^2 - 3x + 2x - 6]$

$= 12[x(x-3) + 2(x-3)]$

$= 12(x-3)(x+2)$

for c.v. $f'(x) = 0$ 1/2

$x = -2, 3$

$\begin{array}{ccccc} \hline & -2 & & 3 & \end{array}$

Case(i) $x < -2$

$f'(x) = (+ve)(-ve)(-ve) = +ve$ 1/2

in $(-\infty, 2)$ $f(x)$ is st $\uparrow$

Case(ii) $-2<x<3$		
$f'(x) = (+ve)(-ve)(+ve) = -ve$		
$\therefore$ in $(-2,3)$ $f(x)$ is st $\downarrow$	1/2	
Case(iii) $x>3$		
$f'(x) = (+ve)(+ve)(+ve) = +ve$	1/2	3
$\therefore$ in $(3,\infty)$ $f(x)$ is st $\uparrow$		
$(-\infty,-2) \cup (3,\infty)$ st $\uparrow$		
$(-2,3)$ st $\downarrow$	1/2	