


$$\frac{98}{100}$$

CASWELL

12 Pages

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1	Student Number	2109158
2	Title of Examination Paper	MATHEMATICS EXAM
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5	Examination Venue	
6	Seat Number	
7	Number of Answer Books handed in	1

[illegible]

$$\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$i.) \frac{4a^3 - 6a^2 - 12a}{2a} = \frac{2a^2 - 3a - 6}{1} \quad (6)$$

$$= \frac{3 \pm \sqrt{9 - 4(2)(-6)}}{2(2)} = \frac{3 \pm \sqrt{9 + 48}}{4} = \frac{3 \pm \sqrt{57}}{4}$$

$$ii.) \frac{36m^3n^3 + 15m^4n^2 + 3m^5n}{3m^5n} = 12m^{-2}n^2 + 5m^{-1}n + 1 \quad (6)$$

$$iii.) \begin{array}{r} 3x + 2 \\ 2x + 5 \overline{) 6x^2 + 19x + 10} \\ \underline{6x^2 + 15x} \\ 4x + 10 \\ \underline{4x + 10} \\ 0 \end{array} \quad (6)$$

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$$iv.) \frac{6p^2q^3r}{3p^3q^2r^{-2}} = 2p^{-1}r^3 \quad (6)$$

$$v.) \frac{2fg}{16h} \times \frac{4gh^2}{4fh} \times \frac{32fh^3}{12f^3} = \frac{256F^2g^2h^5}{768F^4h^2} = \frac{f^{-2}g^2h^3}{3} \quad (4)$$

$$2. \quad \begin{array}{r} 1760 \\ 363 \overline{) 1760} \end{array} \quad \begin{array}{r} 50 \\ 66 \overline{) 50} \end{array}$$

$$c.) (2x-1)(3x+5) = (6x-5)(x-9)$$

$$6x^2 + 10x - 3x - 5 = 6x^2 - 54x - 5x + 45$$

$$6x^2 + 7x - 5 = 6x^2 - 59x + 45$$

$$6x^2 + 7x = 6x^2 - 59x + 50$$

$$6x^2 = 6x^2 - 66x + 50$$

$$50 - 66x = 0$$

$$-66x = -50$$

$$x = \frac{50}{66} = \frac{25}{33} \quad (8)$$

$$(i.) \quad \frac{x-4}{5} = \frac{2x-1}{3}$$

$$\begin{array}{r} 30 \\ 30 \\ \hline \end{array}$$

$$3(x-4) = 5(2x-1)$$

$$3x-12 = 10x-5$$

$$3x-7 = 10x$$

$$-7 = -7x$$

$$x = \underline{1}$$

(7)

b.

$$(i.) \quad 4-q^2 = (q+2)(2-q)$$

(5)

$$(ii.) \quad 3ab+4cd-cb-12ad.$$

$$= 3ab-12ad+4cd-cb$$

$$= 3a(b-4d) + c(4d-b)$$

(5)

$$(iv.) \quad q^2 - 4qr = q(q-4r)$$

(5)

$$3. \quad \begin{array}{l} 2x+4y=16. \\ 3x+2y=7. \end{array} \Rightarrow x = \frac{16-4y}{2} = 8-2y$$

$$3(8-2y)+2y=7$$

$$24-6y+2y=7$$

$$24-4y=7$$

$$-4y=-17$$

$$y = \underline{\underline{17/4}}$$

(5)

$$\begin{array}{r} 10 \\ 10 \\ \hline \end{array}$$

$$2x + 4(17/4) = 16.$$

$$2x + 17 = 16.$$

$$2x = -1$$

$$x = \underline{\underline{-1/2}}$$

4.

$$A = \begin{pmatrix} 1 & 1 & 6 \\ 1 & 2 & 2 \\ 1 & 3 & -1 \end{pmatrix}$$

$$\det(A) = 1 \cdot \begin{vmatrix} 2 & 2 \\ 3 & -1 \end{vmatrix} - 1 \cdot \begin{vmatrix} 1 & 2 \\ 1 & -1 \end{vmatrix} + 6 \cdot \begin{vmatrix} 1 & 2 \\ 1 & 3 \end{vmatrix}$$

$$\det(A) = ((2 \times -1) - (3 \times 2)) - ((1 \times -1) - (2 \times 1)) + 6((1 \times 3) - (2 \times 1))$$

$$\det(A) = (-2 - 6) - (-1 - 2) + 6(3 - 2)$$

$$\det(A) = -8 + 3 + 6$$

$$\det(A) = 1 \quad \therefore A^{-1} \text{ exists.}$$

$$\text{Matrix of minors of } A = \begin{pmatrix} -8 & -3 & 1 \\ -19 & -7 & 2 \\ -10 & -4 & 1 \end{pmatrix}$$

$$\begin{array}{ccc} + & - & + \\ - & + & - \\ + & - & + \end{array} \quad \text{Matrix of cofactors of } A = \begin{pmatrix} -8 & 3 & 1 \\ 19 & -7 & -2 \\ -10 & 4 & 1 \end{pmatrix}$$

$$\text{Adjoint of } A = \begin{pmatrix} -8 & 19 & -10 \\ 3 & -7 & 4 \\ 1 & -2 & 1 \end{pmatrix} \quad (\text{transpose})$$

$$A^{-1} = \frac{1}{\det(A)} (\text{adj}) = \frac{1}{1} \begin{pmatrix} -8 & 19 & -10 \\ 3 & -7 & 4 \\ 1 & -2 & 1 \end{pmatrix}$$

check $AA^{-1} = I_3$.

$$\therefore \begin{pmatrix} -8 & 19 & -10 \\ 3 & -7 & 4 \\ 1 & -2 & 1 \end{pmatrix} \begin{pmatrix} 1 & 1 & 6 \\ 1 & 2 & 2 \\ 1 & 3 & -1 \end{pmatrix} = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix} = I_3.$$

$$\frac{10}{10}$$

$\therefore A^{-1}$ is correct.

5.)

$$\frac{x+7}{(x-2)(x+1)} = \frac{A}{x-2} + \frac{B}{x+1}$$

$$x+7 = A(x+1) + B(x-2)$$

$$\text{if } x=2 \quad 2+7 = A(2+1) + B(2-2)$$

$$9 = 3A$$

$$A = 3.$$

$$\text{if } x=-1 \quad -1+7 = A(-1+1) + B(-1-2)$$

$$6 = -3B$$

$$B = -2.$$

$$\therefore \frac{x+7}{(x-2)(x+1)} = \frac{3}{x-2} - \frac{2}{x+1}$$

$$\frac{10}{10}$$

6
i.)

$$x^2 + 11x + 30 = 0.$$

$$(x+5)(x+6) = 0$$

$$\therefore x = -5 \text{ or } -6.$$

$$x+b=0$$

$$x=-b$$

$$x+5=0$$

$$x=-5$$

4

ii.)

$$x^2 - 11x = 0. \quad x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{11 \pm \sqrt{(-11)^2 - 4(1)(0)}}{2(1)}$$

$$x = \frac{11 \pm \sqrt{121}}{2}$$

3

$$x = \frac{11 \pm 11}{2}$$

$$x = \frac{22}{2} = 11 \quad \text{or} \quad x = 0.$$

10
10

iii.)

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

$$(x-2)(x+2)$$

$$\therefore x = +2 \text{ or } -2.$$

3