Grade 11 June Exam 2019

Memo : Paper 1 2019

1.1.1. $3x^2 - 7x = 0$
$x(3x-7) = 0$ ✓ factors
$x = 0$ or $x = \dfrac{7}{3}$ ✓ x-values   (2)

1.2. $5x^2 = 3x + 6$
$5x^2 - 3x - 6 = 0$ ✓ std form
$a = 5$ $b = -3$ $c = -6$
$x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
$x = \dfrac{-(-3) \pm \sqrt{(-3)^2 - 4(5)(-6)}}{2(5)}$ ✓ subst
$x = \dfrac{3 \pm \sqrt{129}}{10}$ ✓
$x = -0,84$ or $x = 1,44$ x-values ✓   [4]

• No sub into formula ¼ max

1.4 $3x^{\frac{2}{3}} - 13x^{\frac{1}{3}} - 10 = 0$
$(3x^{\frac{1}{3}} + 2)(x^{\frac{1}{3}} - 5) = 0$ ✓
$x^{\frac{1}{3}} = -\dfrac{2}{3}$ or $x^{\frac{1}{3}} = 5$ ✓ both
$(x^{\frac{1}{3}})^3 = (-\sfrac{2}{3})^3$ $(x^{\frac{1}{3}})^3 = (5)^3$
$x = -\dfrac{8}{27}$ or $x = 125$ ✓✓ sums   (4)

1.13 $\sqrt{2-x} - 4 = x$

$\sqrt{2-x} = x+4$
$(\sqrt{2-x})^2 = (x+4)^2$ ✓ square
$2 - x = x^2 + 8x + 16$
$x^2 + 8x + 16 - 2 = 0$
$x^2 + 9x + 14 = 0$ ✓ std
$(x+2)(x+7) = 0$ ✓ factors
$x = -2$ or $x \neq -7$ ✓ constr rej
$\therefore x = -2.$ (4)

11.5 $4^{x+1} + 5.2^x = 6$ $4 = 2^2$
$2^{2x+2} + 5.2^x - 6 = 0$
$2^{2x}.2^2 + 5.2^x - 6 = 0$
$4.2^{2x} + 5.2^x - 6 = 0$ ✓ std form
Let $k = 2^x$ $k^2 = 2^{2x}$
$4k^2 + 5k - 6 = 0$
$(4k-3)(k+2) = 0$ ✓ factors
$k = \dfrac{3}{4}$ or $k = -2$
$2^x = \dfrac{3}{4}$ ✓   or $2^x = -2$ ✓ both
$x = \dfrac{\log 3/4}{\log 2}$ ✓ taking   no soln ✓ conclusion
$= -0,42$ ✓ sum
    (7)

3.

1.6 $2x^2 - 7x - 15 \geq 0$

$(2x+3)(x-5) \geq 0$ ✓ factors

critical values $x = -\frac{3}{2}$ or $x = 5$

$x \leq -\frac{3}{2}$ or $x \geq 5$ (3)

ans

2.1 $a - 6 = -\frac{9}{a}$ $(a \neq 0)$

$LCD = a$

$a^2 - 6a = -9$

$a^2 - 6a + 9 = 0$ ✓ Std form

$(a-3)(a-3) = 0$ ✓ factors

$\therefore a = 3$ ✓ ans

2.2 $2x^2 + x = 3$

$2x^2 + x - 3 = 0$ ✓ Std Form

$(x-1)(2x+3) = 0$ ✓ factors

$x = 1$ or $x = -\frac{3}{2}$ ✓ ans   (3)

4.

1.3 $2x^2 - 3xy = -4$ and $4 = 2x + y$

$y = 4 - 2x$

$2x^2 - 3x(4 - 2x) = -4$

$2x^2 - 12x + 6x^2 = -4$

$2x^2 - 12x + 6x^2 + 4 = 0$

$8x^2 - 12x + 4 = 0 \div 4$

$2x^2 - 3x + 1 = 0$

$(2x-1)(x-1) = 0$

$x = \frac{1}{2}$ or $x = 1$ ✓ both x's

$y = 4 - 2\left(\frac{1}{2}\right)$ or $y = 4 - 2(1)$

$y = 4 - 1$ $y = 4 - 2$

$y = 3$ $y = 2$ ✓ both y's   (6)

14.1

$$= \frac{3^{2017+1}}{3^{2016} + 3^{2017+1}}$$

$$= \frac{3^{2017} \cdot 3}{3^{2017} \cdot 3^2 + 3^{2017}}$$

$$= \frac{3^{2017}(3^2 + 1)}{3^{2017} \cdot 3}$$

$$= \frac{10}{3} \qquad (2)$$

Question 3

3.1 $3x^2 - 2x - 7 = 0$

$\Delta = b^2 - 4ac$

$\Delta = (-2)^2 - 4(3)(-7)$ ✓

$= 4 + 84$

$= 88$ ✓

$\Delta > 0$ real roots, $\Delta \neq$ perfect square irrational roots, $\Delta \neq 0$ unequal roots

∴ roots are real, irrational and unequal. ✓ all 3

(3)

$\dfrac{5(3\sqrt{5}+1)}{5}$ or $\dfrac{15\sqrt{5}}{5} + \dfrac{5}{5}$

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* ALL STEPS (MN'S) BE
SHOWN + (WOC)

Question 2

1. $\sqrt{98}\left(\sqrt{32} - \sqrt{18}\right)$

$= \sqrt{49 \times 2}\left(\sqrt{16 \times 2} - \sqrt{9 \times 2}\right)$ ✓ must be shown / all 3

$= 7\sqrt{2}\left(4\sqrt{2} - 3\sqrt{2}\right)$ ✓ all 3

$= 7\sqrt{2}\left(\sqrt{2}\right)$

(4)

$= 7 \times 2$

$= 14$ ✓

2. $2x^{\frac{3}{4}}\left(3x^{-\frac{4}{3}} - x^{-\frac{3}{4}}\right)$

$= 6x^{-\frac{7}{12}} - 2x^0$ ✓

$= 6x^{-\frac{7}{12}} - 2$

(2)

3. $\left(5 - 2\sqrt{3}\right)^2 = \left(5 - 2\sqrt{3}\right)\left(5 - 2\sqrt{3}\right)$

$= 25 - 20\sqrt{3} + 4 \cdot 3$ ✓

$= 37 - 20\sqrt{3}$

(2)

4. $\dfrac{15 + \sqrt{5}}{\sqrt{5}} = \dfrac{15 + \sqrt{5}}{\sqrt{5}} \cdot \dfrac{\sqrt{5}}{\sqrt{5}}$ rationalisation

$= \dfrac{15\sqrt{5} + 5}{5}$

$= \dfrac{15\sqrt{5} + 5}{5}$

(3)

both terms

$= 3\sqrt{5} + 1$ ✗

7

3.2 $4x - 5 = p(x^2 - 1)$ $p \neq 0$

$4x - 5 = px^2 - p$

$-px^2 + 4x - 5 + p = 0$

$px^2 - 4x + 5 - p = 0$

for equal roots $\Delta = 0$

$\therefore b^2 - 4ac = 0$

$(4)^2 - 4(-p)(-5+p) = 0$ Sub into Δ

and

$16 + 4p(-5+p) = 0$ $\Delta = 0$

$16 - 20p + 4p^2 = 0$

$4p^2 - 20p + 16 = 0$

$p^2 - 5p + 4 = 0$

$(p-4)(p-1) = 0$

$p = 4$ or $p = 1$

(5)

8

3.3 $x^2 - 5 = 2x + k$

$x^2 - 2x - 5 - k = 0$

$\Delta = (-2)^2 - 4(1)(-5-k)$

$= 4 + 20 + 4k$

$= 4k + 24$

for no intersection

$\Delta < 0$

$4k + 24 < 0$

$k < -6$ (4)

Question 4

4	7	11	16	22
	4	3	5	6
		1	1	1

$a+b+c=4$

$3a+b=3$

$2a=1$

$a=\frac{1}{2}$ ✓

$b=\frac{3}{2}$

$\frac{1}{2}+\frac{3}{2}+c=4$

$c=2$

$T_n = \frac{1}{2}n^2 + \frac{3}{2}n + 2$ ✓

4.3

$T_{232} = \frac{1}{2}(232)^2 + \frac{3}{2}(232) + 2$

$= 27262$ ✓

4.4

$232 = \frac{1}{2}n^2 + \frac{3}{2}n + 2$ ✓ equate

$\frac{1}{2}n^2 + \frac{3}{2}n + 2 - 232 = 0$

$\frac{1}{2}n^2 + \frac{3}{2}n - 230 = 0$ ✓ past form

$n^2 + 3n - 460 = 0$ ✓

$(n+23)(n-20) = 0$ ✓ factors

$n = -23$ or $n = 20$

$\therefore n = 20$ ✓ selecting

Question 4

4.2

4	p	11	q	22

$p-4 \quad 11-p \quad q-11 \quad 22-q$

$(11-p)-(p-4) \quad (q-11)-(11-p) \quad (22-q)-(q-11)$

$-2p+15 \qquad q+p-22 \qquad 33-2q$

$p-4,\ 11-p,\ q-11,\ 22-q$

$-2p+15,\ q+p-22,\ 33-2q$ — 1st diff.

2nd diff.

$-2p+15 = 1$ ✓

$-2p = -14$

$p = 7$

$33-2q = 1$ ✓

$32 = 2q$

$q = 16$

q ✓ (4)

$\therefore p = 7$ and $q = 16$ ✓ shown

• If $p=7$ and $q=16$ are used

0/4

5.4

$g(x) = 2\left(\frac{1}{3}\right)^{x-1} + 1$

Shifted 2 unit right 3 units down.

$y = 2\left(\frac{1}{3}\right)^{x-1-2} + 1 - 3$

$\therefore y = 2\left(\frac{1}{3}\right)^{x-3} - 2.$ ②

5.5.

$-y = 2\left(\frac{1}{3}\right)^{x-1} + 1$

$y = -2\left(\frac{1}{3}\right)^{x-1} - 1$ **(2)**

ans only $\frac{2}{2}$

→ other point: $x = 1$, $y = 2\left(\frac{1}{3}\right)^{1-1} + 1$
$= 3$

Question 5

5.1 Horizontal asymptote
$y = 1$

y-intercept   let $x = 0$

$y = 2\left(\frac{1}{3}\right)^{0-1} + 1$

$y = 2(3) + 1$

$y = 7$

x-intercept   let $y = 0$

$2\left(\frac{1}{3}\right)^{x-1} + 1 = 0$

$\left(\frac{1}{3}\right)^{x-1} = -\frac{1}{2}$ ∴ no soln.   (3)

5.2 Decreasing function   A

5.3 $y \in (1 ; \infty)$ or $y > 1$

Question 7.

$f(-1) = -(-1)^3 + 7$

$= 8$

$f(2) = -(2)^3 + 7$

$= -1$

Average grad $= \dfrac{8 - (-1)}{-1 - (2)}$

$= \dfrac{9}{-3}$

$= -3.$

③

Total 100 Marks