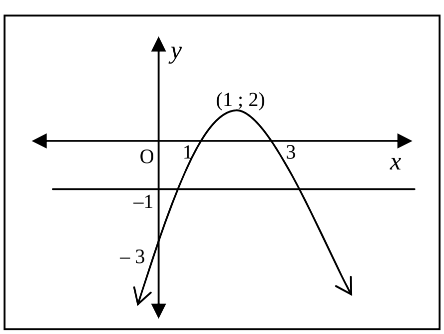
MATHEMATICS P1 SG

MEMORANDUM

NO.	SOLUTION	ALTERNATE SOLUTION/REMARKS
1.1.1	$f(-1) = -1(-1+2) - 4$ $= -5$ (2)	✓ subst ✓ answer
1.1.2	$x^2 + 2x - 4 = 0$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $x = \frac{-2 \pm \sqrt{2^2 - 4(-4)}}{2}$ $= \frac{-2 \pm \sqrt{20}}{2}$ $= 1{,}24$ or $-3{,}24$ (7)	✓ multiplying ✓ std. form ✓ formula ✓ subst ✓ simplification ✓✓for each answer
1.2	$3x^2 + 2x + p + 2 = 0$ $\Delta = (2)^2 - 4(3)(p+2)$ $= 4 - 12p - 24$ $= -12p - 20$ $-12p - 20 < 0$ or $\Delta < 0$ (non - real roots) $-12p < 20$ $p > -\frac{5}{3}$ (7)	✓ use of Δ ✓ subst ✓ value of Δ (simplification) ✓ $\Delta < 0$ ✓ transposing ✓✓ correctly solving for p
1.3	$\Delta = (3)(11) = 33$ roots are real, irrational and unequal (3)	✓ value of Δ ✓✓ irrational ; unequal
1.4	From 1: $y = 2x - 7$ Subst. Into 2: $x^2+x(2x-7)+(2x-7)^2=21$ $x^2+2x^2-7x+4x^2-28x+49 =21$ $7x^2-35x+28 = 0$ $x^2-5x+4 = 0$ $(x-1)(x-4) = 0$ $x =1$ or $x = 4$ $y = -5$ $y =1$ (8)	✓ solving for y ✓ subst. ✓ simplification ✓ std form ✓ factors ✓ x - values ✓✓ y - values

2.1	$f(2) = a(2)^3 - 5(2)^2 - 2(2) + 5 = -3$ $8a - 20 - 4 + 5 = -3$ $8a = 16$ $a = 2$ (5)	✓ $f(2)$ – method ✓ correct subst ✓ $f(2) = -3$ ✓ simplification ✓ answer
2.2	$f(1) = 2 - 3 - 5 + 6 = 0$ $\therefore (x-1)$ is a factor of $f(x)$ $\therefore f(x) = (x-1)(2x^2 - x - 6)$ $= (x-1)(2x+3)(x-2)$ $\therefore x = 1 \ ; \ \frac{2}{3} \ ; \ 2$ (6)	✓ $f(1) = 0$ ✓ finding the linear factor ✓ ✓ the quadratic factor ✓ fully factorised ✓ all 3 roots
3.1.1	$f(0) = -3 \quad \therefore$ y-intercept is -3 or $(0 ; -3)$ $-x^2 + 4x - 3 = 0$ $x^2 - 4x + 3 = 0$ $(x-1)(x-3) = 0$ $x = 1$ or 3 $\therefore$ x-intercepts are $(1 ; 0)$ and $(3 ; 0)$ (4)	✓ y-intercept ✓ $f(x) = 0$ ✓ factors ✓ x-intercepts
3.1.2	$x = -\frac{b}{2a}$ or $\frac{SR}{2}$ or $f'(x) = 0$ $= -\frac{(4)}{2(-1)}$; $= \frac{1+3}{2}$; $-2x + 4 = 0$ $= 2$; $= 2$; $2x = 4$; $x = 2$ $y = -(2)^2 + 4(2) - 3$ or $y = \frac{4ac - b^2}{4a} = \frac{4(-1)(-3) - (4)^2}{4(-1)} = 1$ $= 1$ $T(2 ; 1)$ (5)	✓ formula ✓ subst. into formula ✓ x - value ✓ subst. ✓ y - value
3.1.3	1 (1)	✓ correct answer
3.1.4 & 3.1.5	 (5) (2)	✓ y-intercept ✓ ✓ x-intercepts ✓ turning point ✓ shape ✓✓ for line graph ($y = -1$)
3.1.6	$1 \leq x \leq 3$ (2)	✓ critical values ✓ inequality signs
3.2.1	$h(x) = \sqrt{9 - x^2}$ (2)	✓ formula ✓ value of r

3.2.2	$f(x) = x + 3$ (2)	✓ correct gradient ✓ correct *y*- cept
4.1.1	$\left(\frac{1}{3}+\frac{1}{2}\right)^{-1}$ $= \left(\frac{5}{6}\right)^{-1}$ $= \frac{6}{5} = 1{,}2$ (3)	✓ writing with positive exponents (inside brackets) ✓ adding ✓ answer
4.1.2	$\frac{3^{2n-2}.3^{9-6n}}{3^{8-4n}}$ $= 3^{2n-2+9-6n-8+4n}$ $= 3^{-1}$ $= \frac{1}{3}$ (6)	✓ same base ✓✓ exponential laws ✓ simplification/ accuracy ✓ exponential law ✓ answer/accuracy
4.1.3	log 4 + log 25 = log 100 =2 (3)	✓✓ log laws ✓ answer
4.1.4	$\frac{7\sqrt{2}-2\sqrt{2}}{5\sqrt{2}} = \frac{5\sqrt{2}}{5\sqrt{2}} = 1$ (4)	✓✓ writing as like surds ✓ simplification ✓ answer
4.2.1	$x^{\frac{3}{4}} = 8$ $(x^{\frac{3}{4}})^{\frac{4}{3}} = (2^3)^{\frac{4}{3}}$ $x = 2^4 = 16$ (4)	✓ dividing by 2 ✓ raising to power $\frac{4}{3}$ ✓ exponential law ✓ answer
4.2.2	$3^x - 3^x.3^{-2} = 24$ $3^x(1 - 3^{-2}) = 24$ $3^x(1 - \frac{1}{9}) = 24$ $3^x = 24 \times \frac{9}{8}$ $27 = 3^3$ $x = 3$ (6)	✓ decomposing ✓ common factor ✓ correct factorisation ✓ $3^{-2} = \frac{1}{9}$ ✓ solving for 3^x ✓ answer
4.2.3	$\log x = \frac{\log 5^4}{\log 5^2} = \frac{4\log 5}{2\log 5} = 2$ $x = 100$ (4)	✓✓ log law ✓ simplification ✓ answer

5.1.1	$a = -1 \quad ; \quad d = 7$ $T_n = a + (n-1)d$ $T_{49} = -1 + 48(7)$ $= 335$ (3)	✓ a & d values ✓ formula ✓ subst & answer
5.1.2	$S_n = \frac{n}{2}[2a + (n-1)d]$ $S_{87} = \frac{87}{2}[2(-1) + 86(7)]$ (3) $= \frac{87}{2}[600]$ $= 26100$	✓ formula ✓ subst ✓ answer
5.2	$S_n = \frac{a(1-r^n)}{1-r}$ $S_{10} = \frac{20[1-(\frac{4}{5})^{10}]}{1-\frac{4}{5}}$ $= 89{,}26$ (4)	✓ value of r ✓ formula ✓ subst ✓ answer
5.3	$r = \frac{2x+2}{3x-2} = \frac{4x+1}{2x+2}$ $(2x+2)^2 = (3x-2)(4x+1)$ $4x^2 + 8x + 4 = 12x^2 - 5x - 2$ $8x^2 - 13x - 6 = 0$ $(8x+3)(x-2) = 0$ $\therefore \quad x = 2$ (6)	✓ $\frac{T_2}{T_1} = \frac{T_3}{T_2}$ ✓ cross multiply ✓ simplification ✓ standard form ✓ factors ✓ answer
5.4	tiles = 5 ; 9 ; 13 ; 17 ; .... $a = 5 \quad ; \quad d = 4$ $T_n = a + (n-1)d$ $= 5 + (n-1)4$ $= 4n + 1$ (3)	✓ setting up maths model ✓ formula ✓ subst. ✓ answer (answer only –full marks)
6	A = 12500 ; r = 0,75 ; n =36 $A = P(1 + \frac{r}{100})^n$ $12500 = P(1 + \frac{\frac{9}{12}}{100})^n$	✓✓ for values of A ; r and n ✓ formula & subst.

	$12500 = P(1+0{,}0075)^{36}$ $P = \frac{12500}{(1{,}0075)^{36}}$ $= R9551{,}86$	✓ making P subject of formula ✓ answer
7.1	$f(x) = 4x^2$ $f(x+h) = 4(x+h)^2 = 4x^2 + 8xh + 4h^2$ $\frac{f(x+h)-f(x)}{h} = \frac{4x^2+8xh+4h^2-4x^2}{h}$ $\quad h \neq 0$ $= 8x + 4h$ $f'(x) = \lim_{h \to 0} \frac{f(x+h)\ f(x)}{h}$ $= 8x$ (5)	✓ calculating $f(x+h)$ ✓ calculating $f(x+h) - f(x$ ✓ calculating $\frac{f(x+h)\ f(x)}{h}$ ✓ calculating limit ✓ correct notation
7.2.1	$\frac{dy}{dx} = 12x^2 + 24x + 9$ (3)	✓✓ ✓differentiating each term
7.2.2	$f(x) = x^{-4} + x^{\frac{1}{2}}$ $f(x) = 4x^{-5} + \frac{1}{2}x^{-\frac{1}{2}}$ (4)	✓✓ writing in power form ✓✓ differentiating
7.3.1	$f'(x) = 0$ $3x^2 - 6x - 9 = 0$ $x^2 - 2x - 3 = 0$ $(x-3)(x+1) = 0$ $x = 3$ or -1 $f(3) = 3^3 - 3(3)^2 - 9(3) + 25 = -2$ $f(-1) = (-1)^3 - 3(-1)^2 - 9(-1) + 25 = 30$ $\therefore$ A(3 ; –2) and C(–1 ; 30) (8)	✓ derivative ✓ derivative = 0 ✓ factors ✓ correct x-values ✓ value of $f(3)$ ✓ value of $f(-1)$ ✓✓ for each t.p
7.3.2	$x_C \leq x \leq x_A$ $-1 \leq x \leq 3$	✓ correct interval selection ✓ answer
7.3.3	$x = 0$ at B $f'(x) = 3x^2 - 6x - 9$ gradient of tangent = $f'(0)$ $= -9$ (5)	✓ x_B ✓ derivative ✓✓for knowing grad. = $f'(0)$ ✓ $f'(2) = -7$

8.1	$b(0) = 1500$ 1500 million bacteria present at beginning (3)	✓ $b(0)$ ✓ 1500 ✓ correct unit (million)
8.2	$b'(t) = 0$ $-8t + 60 = 0$ $t = 7{,}5$ (3)	✓ $b'(t)$ ✓ $b'(t) = 0$ ✓ answer
	GRAND TOTAL:	**150**

THE END