RVHS H2 Maths Preliminary Examination Paper 1

Qn/No	Topic Set	Answers
1	Complex Numbers	$a = -18$, $b = 45$, $z = 1+2i$, $z = 1-2i$, $z = 3i$, $z = -3i$
2	Integration Techniques	$-3 \le x < 0$ or $x \ge 3$ $18\ln 3 - 1 - 9\ln(4n) + \dfrac{n^2}{2}$ As $n \to 0$, $I \to +\infty$
3	Vectors	(i) $\overrightarrow{OQ} = \begin{pmatrix} 2 \\ -2 \\ 4 \end{pmatrix}$ (ii) $(\mathbf{a} \cdot \mathbf{c})\mathbf{c}$ is the projection vector of $\mathbf{a}$ onto $\mathbf{b}$. (iii) $0 < p < 2$ (iv) $\lvert \mathbf{a} \times \mathbf{b} \rvert$ is the area of the rhombus OAQB.
4	Maclaurin's Series	$y = \dfrac{\pi^2}{4} - \pi x + x^2 + \dots$ (i) $y = -\pi x + \dfrac{\pi^2}{4}$ (ii) $-\pi + 2x$
5	Sequence & Series	(i) 83.2 (iii) 9 (iv) 200
6	Functions	(i) A horizontal line $y = k$ where $-4 < k \le 0$ cuts the graph of $y = f(x)$ twice, thus f is not one-to-one. Therefore f^{-1} does not exist. (ii) Largest value of $a = -1$. (iii) $x = \dfrac{-1-\sqrt{13}}{2}$ (iv) $R_g = (0,2)$ & $D_f = (-\infty, 1]$ Since $R_g \not\subset D_f$. Thus, fg does not exist. (v) $D_g = [1.2, 3)$ $R_{fg} = (-3, 0]$
7	Curve Sketching	(ii) $y = 2x + 7$ and $x = -3$ (iv) $k < -\dfrac{\sqrt{481}}{3}$ or $k > \dfrac{\sqrt{481}}{3}$.
8	Application of Differentiation (Tangent & Normal)	(i) $\dfrac{dy}{dx} = \operatorname{cosec} t$ (iii) 0.75 (iv) $\dfrac{1}{4x^2} - \dfrac{1}{4y^2} = 1$

9	Summation, MI	(a) (ii) $\dfrac{5}{12} - 2\ln(3628800)$
10	Vectors	(i) $\theta = 26.6^o$, $\dfrac{4\sqrt{5}}{5}$
		(ii) $p_4 : \mathbf{r} \cdot \begin{pmatrix} 0 \\ 2 \\ -1 \end{pmatrix} = 18$ or $p_4 : \mathbf{r} \cdot \begin{pmatrix} 0 \\ 2 \\ -1 \end{pmatrix} = -6$
		(iii) $l : \mathbf{r} = \begin{pmatrix} 0 \\ 1 \\ 2 \end{pmatrix} + \gamma \begin{pmatrix} -2 \\ \beta \\ 2\beta \end{pmatrix}$, $\gamma \in \mathfrak{R}$
		(iv) $\lambda = 5$, $\mu \neq 1$