1. The function $f(n)=4f(n+1)-f(n-1)$ is defined for all integers n, such that $f(-1)=f(1)=2$. Evaluate $f(3)$. **(2.5 Marks)**

2. Given that $a,b\in\mathbb{R}^+$ such that $a^3b=5$, find the value of $a^2\sqrt{\frac{125b}{a}}+ab\sqrt{\frac{5a}{b}}$.

(2.5 Marks)

3. Given that $\frac{1}{(x-5)(2x+3)}=\frac{A}{x-5}+\frac{B}{2x+3}$, determine the value of $\frac{A}{B}+4$.

(2.5 Marks)

4. Given that $f(x)=3x+\sqrt{x+\sqrt{2}}-\frac{4x^2-x-\sqrt{2}}{2x-\sqrt{x+\sqrt{2}}}$, find the value of $\frac{1}{15}f(2025)$.

(2.5 Marks)

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5. Given that $A=\begin{pmatrix} a & -1 & 3 \\ 0 & 1 & 2 \\ b & 2 & 1 \end{pmatrix}$ such that $C_{22}(A)=7$ and $C_{23}(A)=0$, determine $\det(7A^{-1})$. **(2.5 Marks)**

6. Find $\cos^2\left(\frac{\pi}{3}\right)+\cos^2\left(\frac{2\pi}{3}\right)+\cos^2(\pi)+\cos^2\left(\frac{4\pi}{3}\right)+\ldots+\cos^2(8\pi)$. **(2.5 Marks)**

7. How many five-digit numbers can be formed from the digits 2, 4, 4, 6, and 8, where each digit is used only once, if the five-digit number is divisible by 4?

(2.5 Marks)

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8. Let $A=\{1,2,3,4,5\}$, and define the set $S=\{f:A\to A \mid f(x)<x+1,\ \forall x\in A\}$.

Find the number of all functions that are members of the set S. **(4.5 Marks)**

9. Given $f(x)=2x^2-x+1$ and $g(x)=x^3+6x^2+12x+7$, what is the value of

$(f\circ g^{-1})(124)$? **(4.5 Marks)**

10. Let Q be the set of rational number and **(4.5 Marks)**

$P=\{x\in Q \mid 6x^4-31x^3+36x^2-15x+2=0\}$.

If $\frac{a}{b}$ be the simplest form of the product of elements in P, then find $a+b$.

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11. Let A be the set of integer solutions to the equation **(4.5 Marks)**

$(x^2+x-2)^3+(2x^2+5x-3)^3=(3x^2+6x-5)^3$.

Find the product of all elements in set A.

12. Let $A=\{x\in R\,|\,|x|\le 6\}$, $B=\{x\in I\,|\,x^2-49\le 0\}$ and $C=\{x\in R\,|\,x^3-3x^2=-4\}$.

Find $n[(A\cap B)\times C]$. **(4.5 Marks)**

13. Diagonals of a trapezoid $ABCD$ with $AB\parallel CD$ intersect each other at the point O. Given that $\angle ADC=\angle AOB=90^\circ$ and $CD=21$ cm. If the ratio of areas ΔAOB and ΔCOD is $16:49$, then find the value of BD^2. **(4.5 Marks)**

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14. There are ten cards numbered 1 to 10. Let $\frac{M}{N}$ be the probability of randomly selecting two cards and their sum is divisible by 7, where $\gcd\left(M,N\right)=1$. Find the value of $M+N$. **(4.5 Marks)**

15. Let n be a positive integer less than 20. **(4.5 Marks)**
Define $A=\left\{n \mid n^2+4 \text{ is a prime number}\right\}$.
Let p be a mean of set A and q be a median of set A. Find the value of pq.

16. Company A can build the Rama 2 Expressway, taking 150 days more than Company B. This construction is completed if company A starts building it for 300 days and then company B continues building it for another 100 days. How long does it take if both companies cooperate to build the Rama 2 Expressway? **(6 Marks)**

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17. The ages of three workers are consecutive odd integers. Six times the sum of their ages is 429 less than the product of the ages of the two youngest workers. What is the age of the oldest worker? **(6 Marks)**

18. Jimmy designs a glass. The boundary of the glass is formed by revolving the following curves about the y−axis: the lines $y=0$ when $0\le x\le 2$, $y=x-2$ when $2\le x\le 3$, and $x=3$ when $1\le y\le 6$, respectively. Let $\frac{M\pi}{N}$ be the volume of a glass, where $\gcd(M,N)=1$. Find the value of $M-N$.

(6 Marks)

19. Rose has 16 apples, 10 oranges, 12 pears and 10 melons. Rose wants to arrange a fruit basket with 10 fruits, where there is at least one of each type. How many ways are there to arrange the fruit basket? (Fruits of the same variety are treated as identical.) **(6 Marks)**

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20. Define $A=\{n\,|\,|n| \text{ is an integer less than } 10.\}$. Let $\frac{M}{N}$ be the probability that a randomly chosen integer n from set A is a solution to the equation $\left(x^4-12x^2-64\right)\left(x^4-81\right)=0$, where $\gcd\left(M,N\right)=1$. Find the value of N^2-M^2.

(6 Marks)

21. If $A=\{\phi,\{\phi,1\},\{\phi,1,\{\phi,1\}\}\}$ and $B=\{\phi,\{\phi\},\{\phi,1\},\{1,\{\phi\}\},\{\phi,1,\{\phi,1\}\}\}$, find $\left(\sqrt{2}\right)^{n(P(A)-B)}$.

(2.5 Marks)

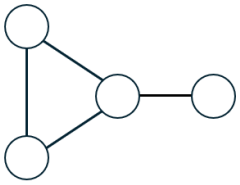
22. Given that $f(x)=2x^3+ax+b$ that $g(x)=ax^2+bx+1$ where $a,b\in\mathbb{R}$. If $f(2)=0$ and the remainder when $g(x)$ is divided by $x-3$ is 4, find $|a+b|$. **(4.5 Marks)**

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23. A quadrilateral $ABCD$ is inscribed in a circle, center O. Suppose that a segment EA is tangent to the circle at the point A, $\angle BAE = 59^\circ$ and $\angle CDA = 117^\circ$. Find the value of $\angle BCO + \angle BAO$. **(2.5 Marks)**

24. Let A be a median of $21,15,18,30,27$ called dataset 1,
B be a median of $12,9,10,13,7,3$ called dataset 2, and
C be a mean of two datasets.
Find the value of $|A+B-C|$. **(2.5 Marks)**

25. Jackson would like to paint four circles as shown in the diagram below. He must paint different colors if any two circles are connected by a line segment. If he has four colors that are red, green, blue, and yellow, how many ways can he paint? **(4.5 Marks)**



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GRADE 10 ANSWER KEY

No.	Answer	No.	Answer
1	1	14	17
2	30	15	61
3	3.5	16	180
4	135	17	35
5	49	18	151
6	12	19	84
7	36	20	345
8	120	21	8
9	16	22	33
10	4	23	63
11	6	24	15.5
12	26	25	72
13	396		

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