This is a Class 1 exam

Lebanon Evangelical School for Boys and Girls

Lebanon Evangelical School

for Boys and Girls — Loueizeh - Baabda

Stage Exam 04

20-25JUN2025

Do NOT write in this box. Your MARK will be placed here.

Subject :	Maths	
Class :	11SE	
Teacher :	Mr. George Mouhayar	
Duration :	1 hour	
You are to answer the questions to this exam on : Squared paper		
Your name :		*Time taken to complete exam*
Your Class :		
Exam Room :		
How many sheets, including cover sheet :		

- Do not open this paper until the teacher in charge instructs you to do so.
- The most important thing to remember in taking an exam is NEVER PANIC.
- If you are caught cheating in this exam, you will be awarded zero for ALL exams that are taken on this day.

I. (18 points)

Calculate the antiderivative for each of the following functions on $\mathbb{R}^+$.

a) $\int(-16x^3 + 9x^2 - 4x + \pi^3)\,dx$

b) $\int\left(\frac{3x^4 + 4x^3 - 5}{x^2}\right)dx$

c) $\int(4x^2 + 5x\sqrt{x} + 1)\,dx$

d) $\int\left(\frac{6}{x^3} - \frac{4}{x^5} + 2\right)dx$

II. (8 points)

Determine the antiderivative $F(x)$ of the following functions:

a. $f(x) = 8x^3 + 3x^2 - 7$ where $F\left(\frac{1}{2}\right) = \frac{3}{4}$

b. $f(x) = 2x + \frac{3}{\sqrt{x}}$ where $F(1) = 4$

III. (2 points)

Given the first term $U_1 = 30$ and the common difference $d = -4$, find the 15^{th} term U_{15} of the arithmetic sequence.

IV. (3 points)

What is the **sum** of the first 25 terms of the arithmetic sequence 60, 54, 48, 42, …?

V. (4 points)

Given two sums of an arithmetic sequence $S_6 = 48$ and $S_4 = 24$, find the common difference d and the first term U_1.

VI. (3 points)

Given the first term $U_1 = 0.5$ and the common ratio $r = 4$, find the sum of the first 7 terms S_7 of the geometric sequence.

VII. (4 points)

Given two terms in a geometric sequence: $U_3 = 8$ and $U_6 = 125$, Find the common ratio r and the first term U_1.

VIII. (8 points)

A library buys new books every month.

- In the first month, they buy 150 books.
- Every month after that, they buy 12 fewer books than the previous month because of budget cuts.
- This purchasing strategy continues for one full year.

a) List the number of books bought in each of the first four months.

b) Write a formula for the number of books U_n purchased in the $n\text{-}th$ month.

c) Calculate how many books the library buys in the eighth month.

d) Determine how many books the library buys in the last month.

Solution For SE04 — Class 1

11SE Maths 20242025

I.

a) $\int(-16x^3+9x^2-4x+\pi^3)\,dx$

$= \int -16x^3\,dx + \int 9x^2\,dx - \int 4x\,dx + \int \pi^3\,dx$

$= -16\frac{x^4}{4} + \frac{9x^3}{3} - 4\frac{x^2}{2} + \pi^3 x + c$

$= -4x^4 + 3x^3 - 2x^2 + \pi^3 x + c$

b) $\int\left(\frac{3x^4+4x^3-5}{x^2}\right)dx$

$= \int \frac{3x^4}{x^2}\,dx + \int \frac{4x^3}{x^2}\,dx - \int \frac{5}{x^2}\,dx$

$= \int 3x^2\,dx + \int 4x\,dx - \int 5x^{-2}\,dx$

$= 3\frac{x^3}{3} + 4\frac{x^2}{2} - 5\frac{x^{-1}}{-1} + c$

$= x^3 + 2x^2 + \frac{5}{x} + c$

c) $\int(4x^2+5x\sqrt{x}+1)\,dx$

$= \int 4x^2\,dx + \int 5x.x^{\frac{1}{2}}\,dx + \int dx$

$= \frac{4x^3}{3} + \int 5x^{\frac{3}{2}}\,dx + x$

$= \frac{4x^3}{3} + \frac{5x^{\frac{5}{2}}}{\frac{5}{2}} + x + c$

$= \frac{4}{3}x^3 + 2x^2\sqrt{x} + x + c$

d) $\int \left(\frac{6}{x^3} - \frac{4}{x^5} + 2\right) dx$

$= \int 6x^{-3} dx - \int 4x^{-5} dx + \int 2 dx$

$= \frac{6x^{-2}}{-2} - \frac{4x^{-4}}{-4} + 2x + c$

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

II. a) $f(x) = 8x^3 + 3x^2 - 7 \qquad F\left(\frac{1}{2}\right) = \frac{3}{4}$

$F(x) = \int (8x^3 + 3x^2 - 7) dx$

$= \int 8x^3 dx + \int 3x^2 dx - \int 7 dx$

$= \frac{8x^4}{4} + \frac{3x^3}{3} - 7x + c$

$= 2x^4 + x^3 - 7x + c$

$F\left(\frac{1}{2}\right) = \frac{3}{4}$

$2\left(\frac{1}{2}\right)^4 + \left(\frac{1}{2}\right)^3 - 7\left(\frac{1}{2}\right) + c = \frac{3}{4}$

$\frac{1}{8} + \frac{1}{8} - \frac{7}{2} + c = \frac{3}{4}$

$-\frac{13}{4} + c = \frac{3}{4}$

$c = \frac{3}{4} + \frac{13}{4}$

$c = 4$

$\Rightarrow F(x) = 2x^4 + x^3 - 7x + 4$

b. $f(x) = 2x + \frac{3}{\sqrt{x}}$ $\quad F(1) = 4$

$$F(x) = \int \left(2x + \frac{3}{\sqrt{x}}\right) dx$$

$$= \int 2x\,dx + \int 3x^{-\frac{1}{2}}\,dx$$

$$= \frac{2x^2}{2} + \frac{3x^{\frac{1}{2}}}{\frac{1}{2}} + c$$

$$= x^2 + 6\sqrt{x} + c$$

$F(1) = 4$

$1^2 + 6\sqrt{1} + c = 4$

$7 + c = 4$

$c = -3$

$\Rightarrow \boxed{F(x) = x^2 + 6\sqrt{x} - 3}$

III.

$u_1 = 30$

$d = -4$

$u_{15} = u_1 + (n-1)d$

$u_{15} = 30 + (14)(-4)$

$\boxed{u_{15} = -26}$

IV.

$u_1 = 60$

$d = -6$

$S_n = \frac{n}{2}[2u_1 + (n-1)d]$

$S_{25} = \frac{25}{2}[2(60) + (24)(-6)]$

$S_{25} = \frac{25}{2}[120 - 144]$

$\boxed{S_{25} = -300}$

V.

$S_6 = 48$

$S_4 = 24$

$S_6 = \frac{n}{2}[2u_1 + (n-1)d]$

$48 = \frac{6}{2}[2u_1 + 5d]$

$\frac{48}{3} = \frac{3(2u_1 + 5d)}{3}$

$16 = 2u_1 + 5d$ (1)

$S_4 = \frac{4}{2}[2u_1 + 3d]$

$\frac{24}{2} = \frac{2(2u_1 + 3d)}{2}$

$12 = 2u_1 + 3d$ (2)

$$\begin{cases} 2u_1 + 5d = 16 \\ 2u_1 + 3d = 12 \end{cases}$$

$u_1 = 3 \quad d = 2$

VI.

$u_1 = 0.5$

$r = 4$

$S_n = u_1\left(\frac{r^n - 1}{r - 1}\right)$

$S_7 = 0.5\left(\frac{4^7 - 1}{4 - 1}\right)$

$S_7 = 2730.5$

VII

$u_3 = 8$ $\quad u_6 = 125$

$u_3 = u_1 r^2$ $\quad u_6 = u_1 r^5$

$u_1 r^2 = 8$ $\quad u_1 r^5 = 125$

$$\frac{u_6}{u_3} = \frac{u_1 r^5}{u_1 r^2} = \frac{125}{8}$$

$$\sqrt[3]{r^3} = \sqrt[3]{15.625}$$

$$\boxed{r = 2.5}$$

$u_1 r^2 = 8$

$u_1 (2.5)^2 = 8$

$u_1 \left(\frac{25}{4}\right) = 8$

$u_1 = 8 \times \frac{4}{25}$

$\boxed{u_1 = 1.28}$

VIII

a) $u_1 = 150$

$u_2 = u_1 - 12 = 138$

$u_3 = 138 - 12 = 126$

$u_4 = 126 - 12 = 114$

b) $u_1 = 150$ $\quad d = -12$

$u_n = u_1 + (n-1)d$

$u_n = 150 + (n-1)(-12)$

$u_n = 150 - 12n + 12$

$u_n = -12n + 162$

c) $u_8 = -12(8) + 162$

$u_8 = 66$

They will buy 66 books.

Last month $\Rightarrow n = 12$

d) $u_{12} = -12(12) + 162$

$u_{12} = 18$

They will buy 18 books in the last month.