ANSWERS TO 1998 HIGHER

PAPER I

1. $y = 2x - 5$ 2. $(x-1)(x+2)(x-5)$

3. (a) $\begin{pmatrix} 8 \\ -5 \\ -5 \end{pmatrix}$ (b) 1 (c) 5 units 4. $3x + 4y = 26$

5. (a) $\vec{AB} = \begin{pmatrix} 6 \\ 3 \\ -6 \end{pmatrix}$ $\vec{AC} = \begin{pmatrix} 2 \\ 1 \\ -2 \end{pmatrix}$ (b) $C(5, 0, 0)$ $D(7, 1, -2)$

6. (a) $x^4 + 4x^2 + 3$ (b) $(x^2+1)(x^2+3)$ 7. (a) $\frac{24}{25}$ (b) $\frac{7}{25}$ (c) $\frac{325}{625}$

8. (a) $u_n \to$ LIMIT AS $n \to \infty$ since 0.3 lies between -1 and 1 (b) $5\frac{5}{7}$

(c) (i) [$u_0 = 1$, $u_1 = 2.6$, $u_2 = 7.4$, $u_3 = 21.8$ ... (CONTINUE) ... $u_7 = 1749.8$]

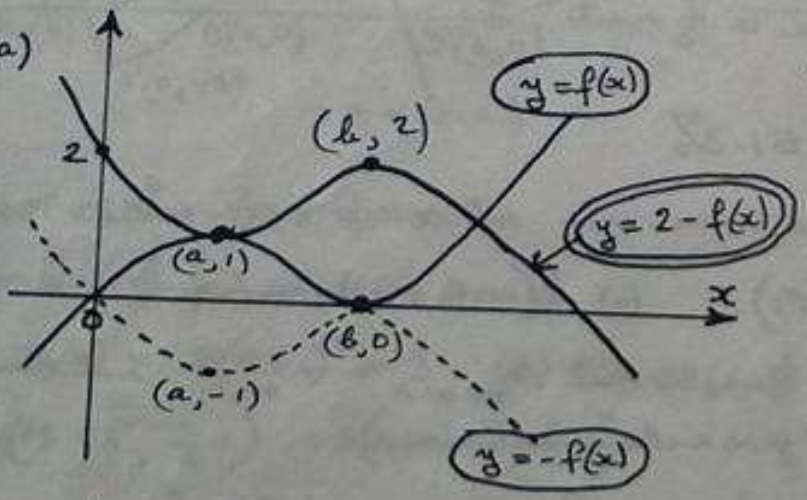
$\therefore$ SMALLEST VALUE OF n IS 7.

(ii) VALUE OF TERM = 1749.8.

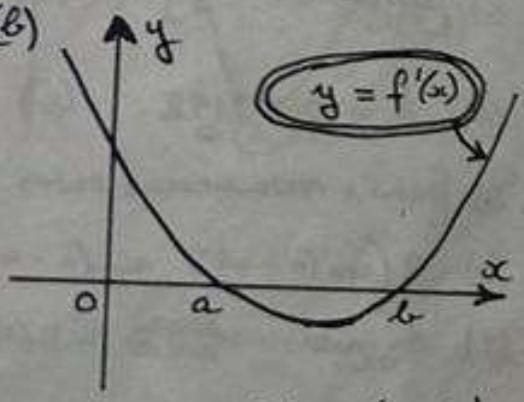
9. $x = \frac{\pi}{6}, \frac{\pi}{2}, \frac{7\pi}{6}, \frac{3\pi}{2}$ 10. $y = 2x^3 - x^2 + 5$ 11. $k = 1$

12. 9.7

13 (a)



(b)



(c) $(0, \frac{1}{2})$

14. $3x^{\frac{1}{2}} + \frac{2}{x^{1/2}}$ 15. (a) $\lambda = 90°$ $\theta = 135°$ (b) $\frac{1}{2}$ unit^2

16. $\frac{3\sqrt{3}}{2}$ 17. (a) 9.8 ms^{-1} (b) 2 seconds

18. (a) $\cos^2\theta + 4\cos\theta + 4 = 0$: Then prove that $\Delta = 0$
Since $\Delta = 0$, there are equal roots

(b) Prove that $\cos\theta = -2$ $\therefore$ NO SOLUTION.

19. $x = 1.544$

PAPER II

1. (a) $\vec{AB} = \begin{pmatrix} 1 \\ 7 \\ 2 \end{pmatrix}$ $\vec{AC} = \begin{pmatrix} 4 \\ 7 \\ -5 \end{pmatrix}$ (b) 51.9° (c) 27.43 units^2

2. (a) AND (b) $(0, -2)$ is a point of inflection
$(3, 25)$ is a maximum S.P.

(a) $2x + y = -1$ (b) $26.6°$

4. (a) $a = 1$, $b = 6$ (b) 36 units^2 (c)(i) $P(5, 5)$ (ii) $20\frac{5}{6}$ units^2

5. (a)(i) $A(-2, 10)$ (ii) $y = 3x + 16$ (b) $B(4, 28)$

6. (a) $(x - \frac{1}{2})^2 + (y - 3)^2 = \frac{13}{4}$ (b)(i) $B(8, 8)$ (ii) $F(14, 12)$ $G(6\frac{1}{2}, 7)$

(c) WORKING OUGHT TO LEAD TO:- $P = \pi\frac{\sqrt{13}}{2} + \pi(2\sqrt{13}) + \pi\left(\frac{5\sqrt{13}}{2}\right)$ etc

7. (a) $f(x) = \sqrt{13}\cos(x + 56.3°)$ $k = \sqrt{13}$ $\alpha = 56.3°$

(b) MAX $= \sqrt{13}$ occurs when $x = 303.7°$
MIN $= -\sqrt{13}$ occurs when $x = 123.7°$

(c) 0

8. (a) 1ST feed = 1g 2ND feed = 1.75g 3RD feed = 2.3125g 4TH feed = 2.7344g.
But $\frac{3}{4}$ of 2.3125 = 1.7344 ∴ 4 feeds are required

(b)(i) $u_{n+1} = 0.75u_n + 1$ $(u_0 = 1)$ where u_n is the amount of plant food after n feeds.

(ii) Prove that the convergent value is 4
Since convergent value (4) < 5g, it can be fed indefinitely.

9. (a) $\frac{31\pi}{5}$ units^3 (b)(i) $\frac{16\pi}{3}$ units^3 (ii) $\frac{32\pi}{3}$ units^3

10. (a) [PROOF]

(b) S.A. is minimised when $r = \sqrt[3]{\frac{400}{3\pi}}$ TABLE OF VALUES REQUIRED

11. (a) PROVE that $\log_e y = bx + \log_e a$ [cf $y = mx + c$]
∴ There is a linear relationship between $\log_e y$ and x.

(b) FIRSTLY :-

x	3.1	3.5	4.1	5.2
$\log_e y$	9.99	11.19	12.99	16.29

Use 1ST/3RD points to obtain

$a = 1.99372$ $b = 3$ [using gradient and $\log_e y = 3x + \log_e a$]

-ie $y = 1.99372e^{3x}$