MATHEMATICS PAPER 2

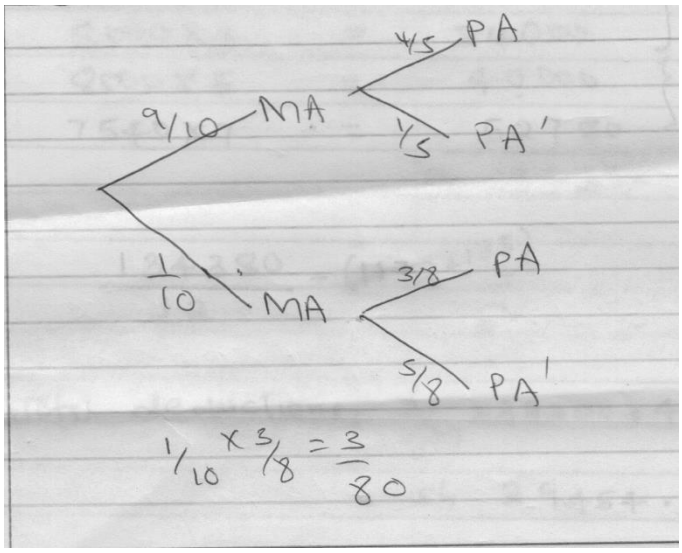
MARKING SCHEME

EMBU NORTH SUB-COUNTY 2018

1	No log 58.32 1.7658 0.9823 2 $\bar{1}.9922$ x2 1.7502 693.5 2.8410 $\bar{2}.9092$ $\frac{2.9092}{3} = \frac{-3}{3} + \frac{1.9092}{3}$ T.6364 → 4.329 x 10^{-1} 0.4329	M1 for all logs M1 for operation M1 for division A1
2.	$\frac{3(\sqrt{7}+2)+1(\sqrt{7}-2)}{49-4}$ $\frac{3\sqrt{7}+6+\sqrt{7}-2}{45}$ $\frac{4\sqrt{7}+4}{45}$	B1 M1 A1
3	$\frac{q^2}{m^2} = \frac{r^2-y^2}{y^2+3}$ $y^2q^2 + 3q^2 = m^2r^2 - m^2y^2$ $y^2q^2 + m^2y^2 = m^2r^2 - 3q^2$ $y^2 = \frac{m^2r^2-3q^2}{q^2+m^2}$ $y = \pm\sqrt{\frac{m^2r^2-3q^2}{q^2+m^2}}$	M1 squaring both sides M1 for factoring A1
4	Max. area 23.25 x 11.55 = 268.5375 Min. area 23.15 x 11.45 = 265.0675 A.E = $\frac{268.5375-265.0675}{2}$ = 1.735 % error $\frac{1.735}{266.8}$ x 100	M1 M1 A1

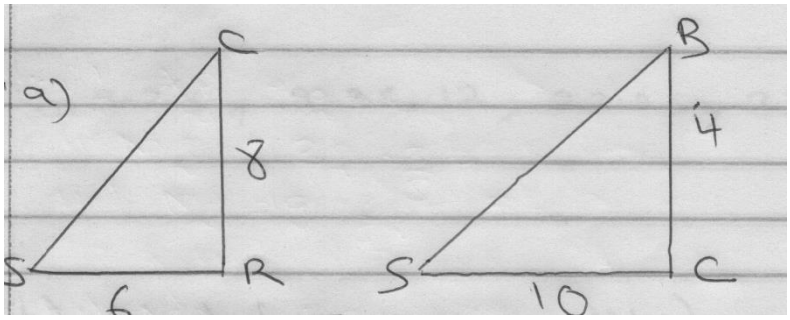
	0.6503%	
5	Selling price = 451 Cost price = $\frac{100}{110}$ x 451 = sh.410 $\frac{450x+350\,y}{x+y}$ = 410 450x + 350y = 410x + 410y 450x – 410x = 410y- 350y 40x = 60y 2x=3y X:y = 3:2	B1 M1 A1
6	FE.Ed=CE.EB 7.8x = 4.1 x 6.9 7.8x = 28.29 X = 3.627 BC^2 = CD x CF y^2 = 11.2 x 22.627 Y = $\sqrt{253.4224}$ 15.92	 B1 M1 A1
7	-1+2 + $\log_2 3 + \log_2 y = \log_2 5$ 1+ $\log_2 3 + \log_2 y = \log_2 5$ $\text{Log}_2 2 + 1\log_2 3 + \log_2 3 + \log_2 y = \log_2 5$ $\text{Log}_2(2x3) + \log_2 y = \log_2 5$ $\text{Log}_2 6 + \log_2 y = \log_2 5$ $\text{Log}_2 y = \log_2 5 - \log_2 6$ $\text{Log}_2 y = \log_2 \left(5/6\right)$ Y =$5/6$	 B1 B1 A1
8	X = $\frac{ky^2}{\sqrt{2}}$ $X^1 = \frac{k(\,1.05y)2}{\sqrt{0.64Z}}$ = $\frac{(1.05)2}{0.8}$ $\frac{ky2}{\sqrt{Z}}$ = 1.3781 Change = 1.3781 – 1 = 0.3781 % change = 0.3781 x 100 = 37.81%	 M1 M1 A1
9	$(PR)^2 = 6^2+3^2 - 2x\ 6x3\cos 120^o$ PR=7.93725 R= $\frac{7.9373}{2\sin 120}$	M1 A1 M1

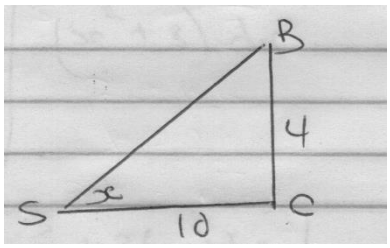
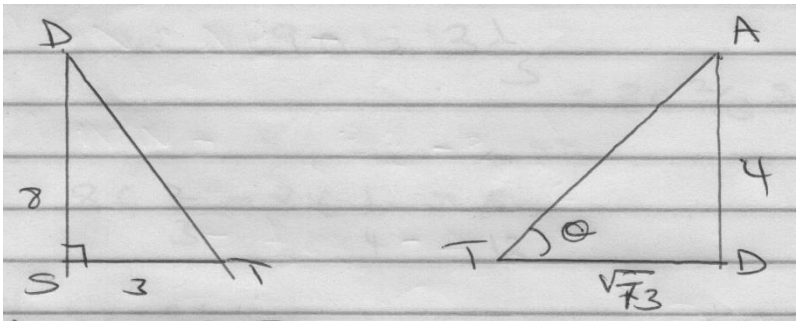
	R= 4.5826	A1
10	4 (5 –x) - 6x =0 20 – 4x – 6x = 0 - 10x = -20 X = 2	M1 A1
11	$2^6 – 6 (2)^5 (½ x)^1 + 15(2)^4 (½x)^2 – 20(2)^3 (½x)^3 + …..$ $64 – 96x + 15x^2 – 20x^3 +…..$ 2 – ½ x = 1.97 0.03 = ½ x ∴ x = 0.06 $(1.97)^6 = 64 – 96(0.06)+ 15(0.06)^2$ = 64 – 5.76 + 0.00324 = 58.24	B1 A1 M1 A1
12	10,18,20,26,30,32,40,42 Q1 = $\frac{18+20}{2}$ = 19 Q3 = $\frac{32+40}{2}$ = 36 Q3 - Q1 = $\frac{36-19}{2}$ =8.5	B1 B1 A1
13.	Centre (0) $\left(\frac{-4+-8}{2}, \frac{2+-4}{2}\right)$ C = (-6 , -1) CA = $\begin{pmatrix}-4\\2\end{pmatrix} - \begin{pmatrix}-6\\-1\end{pmatrix} = \begin{pmatrix}2\\3\end{pmatrix}$ r = $\sqrt{2^2 + 3^2} = \sqrt{13}$ $(x + 6)^2 + (y+1)^2 = \left(\sqrt{13}\right)^2$ $x^2 + 12x + 36 + y^2 + 2y + 1 = 13$ $x^2 + 12x + y^2 + 2y + 24 =0$ $X^2+Y^2+12X+2Y+24=0$	B1 M1 M1 A1
14.	$6(1-\sin^2 \theta)- \sin \theta - 4 = 0$ $6 \sin^2 \theta + \sin \theta -2= 0$ Let $\sin \theta = y$ $6y^2 + y -2 = 0$ $3y(2y – 1) + 2 (2y-1) =0$ $(3y + 2)=0 \quad 2y -1 =0$ $Y = \frac{-2}{3}$ or y = ½ $\theta = 30^o, 150^o$	M1 M1 A1

15	$15000\left(1+\frac{3}{100}\right)^8$ = 15000 x 1.2668 sh19,002	B1 M1 A1
16	 	M1 for tree diagram A1
17a	38300 + 12000 + 3600 = 53900 $\frac{53900\ x\ 12}{20}$ = ε 32340	M1 A1
b.	8800x 2 = 17600 8000 x 3 = 24000 8000 x 5 = 40000 7540 x 7 = 52780 Shs 134380 $\frac{134380}{12}$ - (1172 + 138) = shs 9888.30	M1 M1 A1 M1 A1
c.i	Total deduction = $\frac{2}{100}$ x 38300 + 4600 + 14200+ 9888.30 = Sh 29454.30	B1
ii.	53900 – 29454 .30 = sh 24445.70	M1 A1
18a		B1 for at least 6 correct B2 for all correct values

θ	0	30	60	90	120	150	180	210	240	270	300	330	360
Y=sin ½ θ	0	0.26		0.71	0.87			0.97			0.5		0
Y =2cos θ	2				-1		-2	-1.73		0		1.73	2

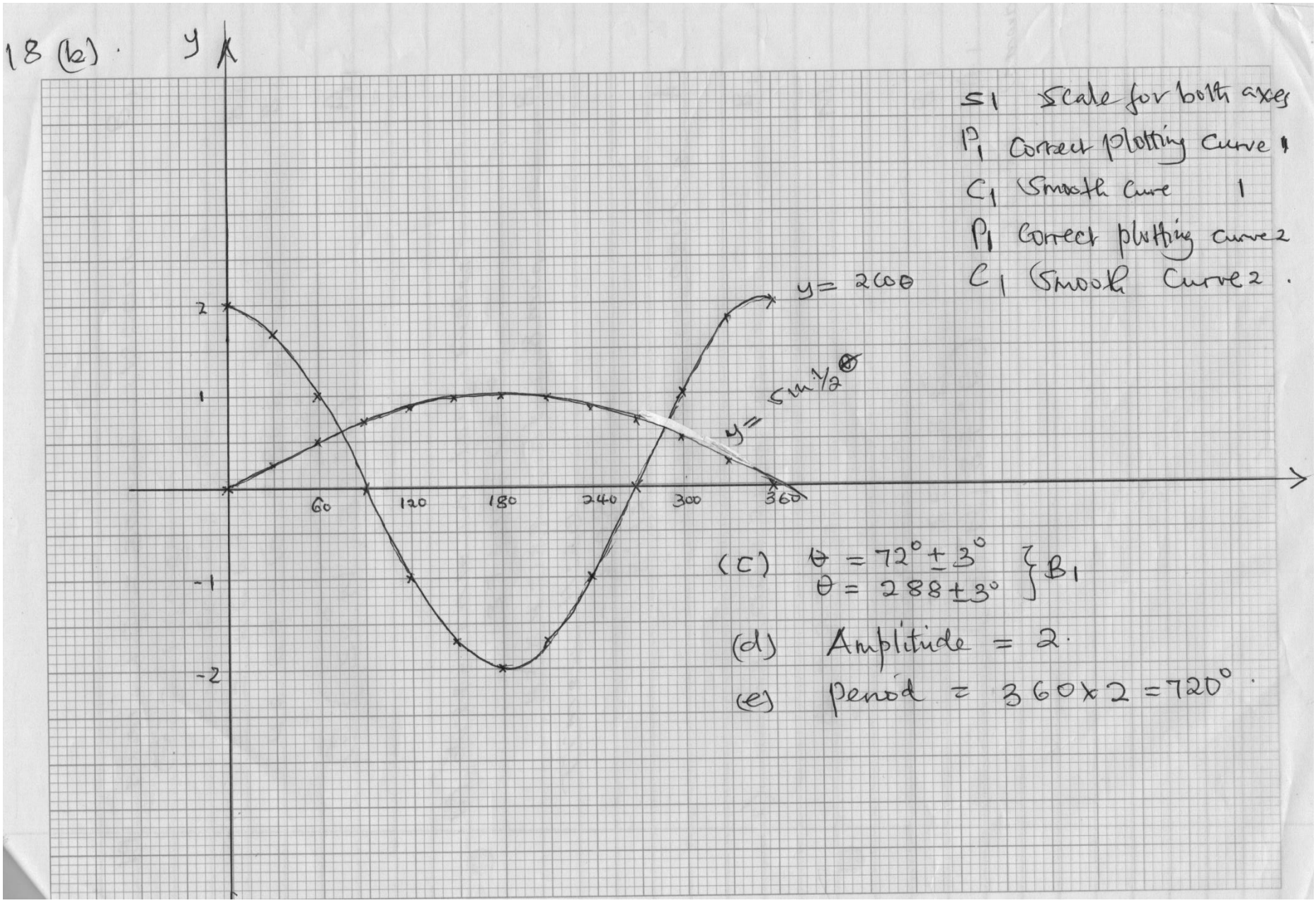
b	Graph paper	
19a	Dist . PQ = 300 x 6 = 1800nm Q = $\frac{1800}{60\ x \cos 50}$ = 46.67 46.67 – 10 = 36.67 = 37^0 Q (50^oN , 37^oE)	**B1** B1 B1 A1
b.	Difference in longitude 37+ 10 = 47° 47 x 4 = 188 3hrs 8min Time 11.20 - 3.08 8.12 8.12 a.m or 0812 hrs	B1 A1
c.	7 x 300 = 2100 nm Q = $\frac{2700}{60}$ = 35 35+ 50 = 85° $(85^O N, 37^O E)$	B1 M1 B1 A1
20	21st term = a+ 20d 65th term = a+64d a+20d+a+64d=368 2a+84d=368 a+ 42d =184 7th term = a+6d = 40 36d=144 d=4	M1 M1 A1
b.	a+6d = 40 a+6(4) =40 a+24=40 a = 16	M1 A1
c.	Sn = $\frac{16}{2}\left((2\ x\ 16\ ) +\ (5\ x4\ )\right)$ = 8 (32+ 60) =736	M1 A1
di	1st term = 16 5th term = 16 + 4(4) =32	B1

	13th term = a+12(4) = 64 16, 32,64 $\frac{32}{16}$ = 2	
ii	$S_{20} = \frac{16\left(2^{20}-1\right)}{2-1}$ = 1677200	M1 A1
21i	AB = - **a**+ **b**	B1(vector notation seen)
Ii	MC = 3**a** – $\frac{3}{5}$**b**	B1
iii	MA= a - $\frac{3}{5}$**b**	B1
bi.	MN =3**a**k - $\frac{3}{5}$**b**k MN = **a** - $\frac{3}{5}$**b** + h**b** – h**a** 3k = 1 –h $\frac{-3}{5}$k = $\frac{-3}{5}$ + h ⟶ -3k = -3 + 5h 2 = 4h h= ½ 3k = 1 – ½ k= $\frac{1}{6}$ h= ½ k = $\frac{1}{6}$	M1 both expressions M1 simultaneous equation M1 solving for unknown M1 substitution at h,k A1 both values of h and k B1 B1
ii	AN : NB = 1:1	
iii	MN = $\frac{1}{6}\left(3a - \frac{3}{5}b\right)$ = ½ a - $\frac{1}{10}$b	
22	Graph paper	
23	 SC= $\sqrt{8^2 + 6^2}$ = 10 (SB)2 = 10^2+ 4^2 SB = 10.77m	B1 B1 A1

b.	Angle BSC is the angle between SB and the plane CDSR  tan x° = $\frac{4}{10}$ tan $^{-1}$ 0.4 = 21.8°	 B1 A1
C	 (DT) = $\sqrt{3^2 + 8^2}$ = $\sqrt{73}$	 B1
	AT = $\left(\sqrt{73}\right)^{2} + 4^2$ = $\sqrt{89}$ = 9.434 = 9.4m	 B1 A1
d	Tan y = $\frac{4}{\sqrt{73}}$ tan $^{-1}$ 0.4682 = 25.09°	 B1 A1
24a	5.25, 9.25, 12, 23.25, 33.25	B2 B1 for any 3 values B2 for all
b.	A = h (sum of widths) = 1 (5.25 + 9.25 + 15.25 + 23.25 + 33.25)	

	= 85.25 square units	
C	$\int_1^6 (x^2+3)dx = \left[\frac{x^3}{3} + 3x + x\right]_1^6$	M1
	$\left[\frac{6^3}{3} + 3(6) + c\right] - \left[\frac{1^3}{3} + 3(1) + c\right]$	M1
	$90 - 3\frac{1}{3}$ $86\frac{2}{3}$ square units	A1
d.	$86\frac{2}{3} - 86\frac{1}{4} = \frac{5}{12}$	M1
	% error $\frac{5}{12} x \frac{3}{260} x100$	M1
	= 0.4808	A1

18 (b).



S1 Scale for both axes

P1 Correct plotting curve 1

C1 Smooth curve 1

P1 Correct plotting curve 2

C1 Smooth curve 2.

(c) $\theta = 72^\circ \pm 3^\circ$
$\theta = 288 \pm 3^\circ$ } B1

(d) Amplitude = 2.

(e) Period = $360 \times 2 = 720^\circ$.

x	-4	-3	-2	-1	0	1	2
$2x^3$		-54		-2			
$3x^2$						3	
$-6x$		18	12	6		-6	
-4							
y		-13				-5	

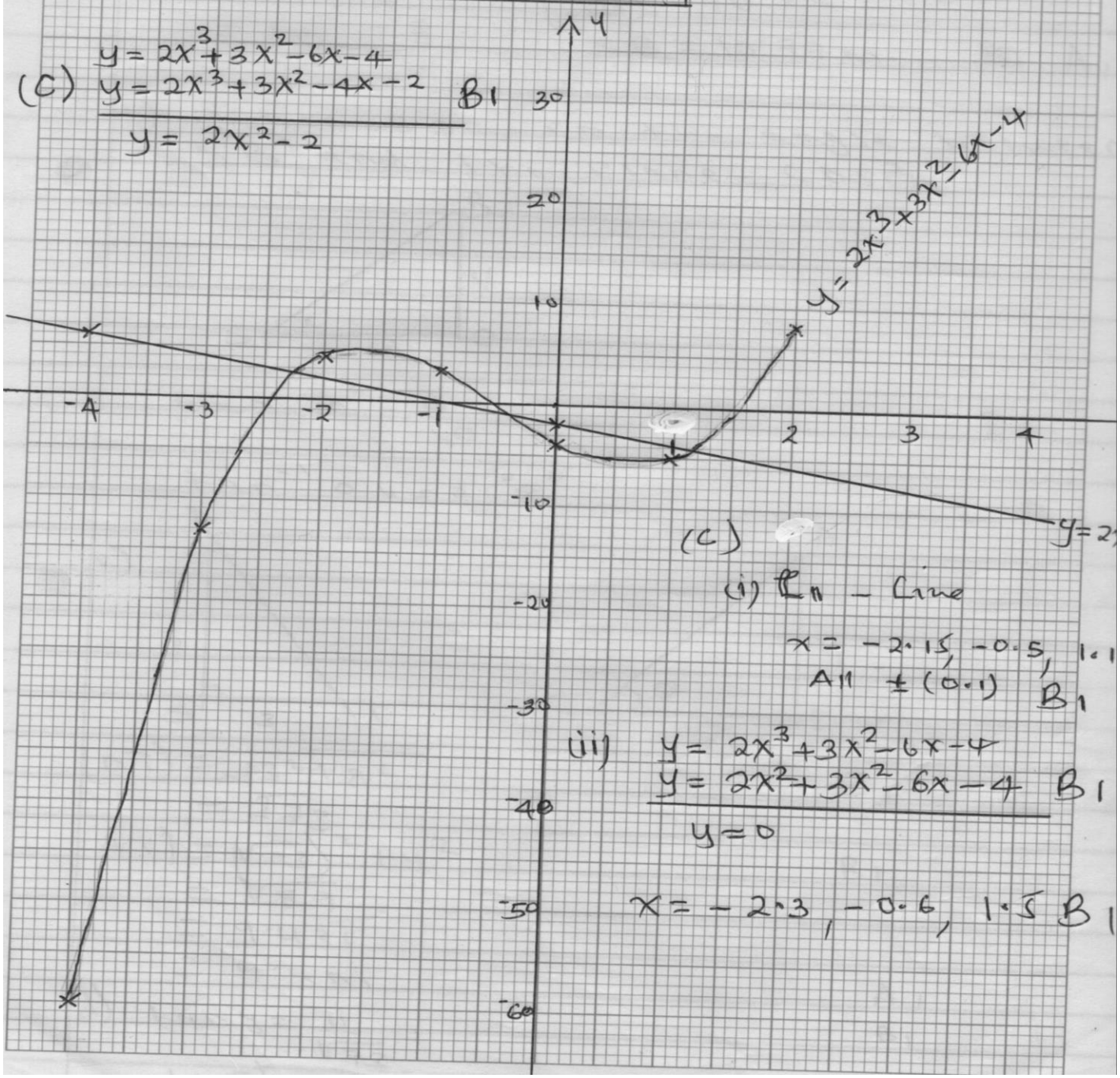
B_1 - for five correct po
B_2 for for all corre
S_1 - Scale
P_1 - Plotting
C_1 - Curve

Line

$y = 2x - 2$

x	-4	0
y	6	-2

(c) $y = 2x^3 + 3x^2 - 6x - 4$
$y = 2x^3 + 3x^2 - 4x - 2$ B1
$y = 2x^2 - 2$



(c)

(i) L_{11} - Line

$x = -2.15, -0.5, 1.1$

All $\pm (0.1)$ B1

(ii) $y = 2x^3 + 3x^2 - 6x - 4$
$y = 2x^2 + 3x^2 - 6x - 4$ B1
$y = 0$

$x = -2.3, -0.6, 1.5$ B1