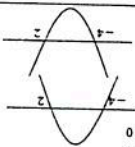
  
**Education**  
 Kwazulu-Natal Department of Education  
 REPUBLIC OF SOUTH AFRICA

**MATHEMATICS P1**  
**PREPARATORY EXAMINATION**  
**SEPTEMBER 2017**  
**MEMORANDUM**

**GRADE 12**  
**NATIONAL SENIOR CERTIFICATE**

Marks: 150  
 Time: 3 Hours  
 This memorandum consists of 16 pages.

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1.1.3	(2)	$(2-x)(x+4) \geq 0$ $(x-2)(x+4) \leq 0$ $-4 \leq x \leq 2$	OR		CACA ✓ end points and inequality Answer only 3/3
1.1.4	(3)	$3^x - 4 = \frac{1}{3^x} = 0$ $3^x - 4 = \frac{1}{3^x}$ $3^{2x} - 4 \cdot 3^x + 1 = 0$ $3^x - 4 \cdot 3^x + 1 = 0$ $(3^x - 1)(3^x - 4) = 0$ $3^x - 1 = 3^0$ or $3^x - 4 = 3^0$ $3^x = 1 = 3^0$ or $3^x = 4 = 3^{\frac{2}{3}}$ $x = 0$ or $x = \frac{2}{3}$	CACA ✓ ✓ answers CACA ✓ ✓ factors	(5)	A ✓ standard form CACA ✓ ✓ factors CACA ✓ ✓ answers
1.2	(3)	$x = -x + 3 \dots (1)$ $2x + 2(-x+3) = 5x(-x+3)$ $2x^2 - 12x + 18 = -5x^2 + 15x$ $9x^2 - 27x + 18 = 0$ $3x^2 - 9x + 6 = 0$ $x^2 - 3x + 2 = 0$ $(x-1)(x-2) = 0$ $x = 1$ or $x = 2$ $x = 1$ or $x = 2$ $y = 2$ or $y = 1$	OR $x = -x + 3 \dots (1)$ $2(-x+3) + 2x^2 = 5(-x+3)$ $2x^2 - 12x + 18 + 2x^2 = -5x^2 + 15x$ $4x^2 - 3x + 3 = 0$ $9x^2 - 27x + 18 = 0$ $3x^2 - 9x + 6 = 0$ $x^2 - 3x + 2 = 0$ $(x-1)(x-2) = 0$ $x = 1$ or $x = 2$ $y = 2$ or $y = 1$	(6)	A ✓ subject of formula CACA ✓ substitution CACA ✓ standard form CACA ✓ values of x CACA ✓ factors

1.1	(2)	$4x^2 = 81$ $x^2 = \frac{81}{4}$ $x = \pm \sqrt{\frac{81}{4}}$ $x = \pm \frac{9}{2}$	A ✓ isolate x <sup>2</sup> A ✓ standard form A ✓ both answers	(2)	
1.1.2	(a)	$x^2 - 5x - 2 = 0$ $x = \frac{5 \pm \sqrt{25 - 4(-2)}}{2}$ $x = \frac{5 \pm \sqrt{33}}{2}$	A ✓ standard form CACA ✓ ✓ answers CACA ✓ ✓ answers (CA only for c = 2) NB: penalise one mark for wrong rounding (hence only).	1.1.2	
1.1.2	(b)	$x^2 - 2 = 5.37$ or $x^2 - 2 = -0.37$ $x^2 = 7.37$ or $x^2 = 1.63$ $x = \pm 2.71$ or $x = \pm 1.28$	CACA ✓ ✓ answers (must have 4 answers) CACA ✓ ✓ answers CACA ✓ ✓ answers	(3)	
1.1.2	(3)	$x^2 - 9x^2 + 12 = 0$ $x^2 - 4x^2 + 4 + 4 - 5x^2 + 10 - 2 = 0$ $(x^2 - 2)^2 - 5(x^2 - 2) - 2 = 0$	A ✓ standard form CACA ✓ substitution into formula CACA ✓ answers	(3)	

1.3	(3)	$\sqrt{10^{-2} - 2 \cdot 10^0}$ $\sqrt{10^{-2} - 2}$ $\sqrt{10^{-2}(100 - 2)}$ $\sqrt{10^{-2}(98)}$ $= 10 \cdot \sqrt{98}$ $= 10 \cdot \sqrt{2}$ $= 70\sqrt{2}$	A ✓ factorization CACA ✓ answer	(3)	
2.1	(2)	$T_1 = 85$ th term of the series $a = 2 + 4(3)$ $a = 128$	A ✓ 43 <sup>rd</sup> term of A.S. A ✓ substitution of a and d into formula CACA ✓ answer	(3)	
2.1.3	(3)	$S_{44} = 42 \times 3 + \frac{43}{2} [2 + 128]$	A ✓ 42 × 3 A ✓ $\frac{43}{2} [2 + 128]$ CACA ✓ answer CACA ✓ answer [CA only 42 and 43 are swapped in the calculation]	(3)	
2.2	2.2.1	$f = \frac{x-2}{(x+2)(x-2)} = x+2; x \neq 2$ OR $f = \frac{x-2}{(x-2)(x+2)(x+2)} = x+2; x \neq \pm 2$	A ✓ value of f and restriction A ✓ condition for convergence CACA ✓ substitution of f	2.2	
2.2.2	(3)	$S_n = \frac{x-2}{x-2} = -x-1$ $S_n \neq 0$ since $x \neq 2$	CACA ✓ S <sub>n</sub> in terms of x A ✓ justification	(3)	

QUESTION 2

4.3	$\frac{x+1}{3} + 2 = 2x + 2$ $2x^2 + 2x = 3$ $2x^2 + 2x - 3 = 0$ $2x^2 + 2x - 3 = 0$ $2x^2 + 2x - 3 = 0$	CA' equating CA' standard form CA' x-values CA' y-values CA' coordinates of A provided that both x and y are positive Answer only 2.2 CA' Substn. x by x - 2 CA' answer [CA only for (+2) substitution]	Mathematics P1 September 2017 7 NSC
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5.1	(0,3)	$x = \frac{-2a}{2(-1)} = 1$ $y = \frac{b}{2(-1)} = -1$	CA' answer CA' axes of symmetry value CA' x-value CA' y-value CA' co-ordinates [CA only y]
5.2	(-1,4)	$x = -1$ $y = 4$	CA' axes of symmetry value CA' x-value CA' y-value CA' co-ordinates [CA only y]
5.3	$x = -1$ $y = 4$	$x = -1$ $y = 4$	CA' axes of symmetry value CA' x-value CA' y-value CA' co-ordinates [CA only y]
5.4	$m = \frac{1-1}{-2-2} = -2$ $c = 2$	$m = \frac{1-1}{-2-2} = -2$ $c = 2$	CA' gradient value CA' substitution of point B or C CA' y-intercept value CA' x-value at B CA' y-value at F CA' answer (provided it is positive)

QUESTIONS

3.1	$T_n = an^2 + bn + c$ $2a + b = 2 \therefore a = 2$ $3a + b = 3 \therefore b = -4$ $a + b + c = 5 \therefore c = 5$ $T_n = 2n^2 - 4n + 5$ $T_{10} = 2(45) - 4(45) + 5 = 4421$	CA' answer CA' substitution n = 45 CA' value of general term CA' formula CA' substitution n = 45 CA' answer	Mathematics P1 September 2017 5 NSC
3.2	$T_n = 2n^2 - 4n + 5$ $T_{10} = 2(45) - 4(45) + 5 = 4421$	CA' answer CA' substitution n = 45 CA' value of general term CA' formula CA' substitution n = 45 CA' answer	Mathematics P1 September 2017 5 NSC
3.3	$T_n = 2n^2 - 4n + 5$ $T_{10} = 2(45) - 4(45) + 5 = 4421$	CA' answer CA' substitution n = 45 CA' value of general term CA' formula CA' substitution n = 45 CA' answer	Mathematics P1 September 2017 5 NSC

QUESTIONS

3.4	$T_n = 2n^2 - 4n - 5 = 100$ $2n^2 - 4n - 105 = 0$ $2a + b = 2 \therefore a = 2$ $3a + b = 3 \therefore b = -4$ $a + b + c = 5 \therefore c = 5$ $T_n = 2n^2 - 4n + 5$ $T_{10} = 2(45) - 4(45) + 5 = 4421$	CA' adding 100 to n <sup>2</sup> term CA' answer CA' answer CA' value of b CA' value of c CA' substitution n = 45 CA' answer	Mathematics P1 September 2017 6 NSC
4.1	$m \text{ of } g = 2$ $c = 2$	CA' gradient CA' y-intercept CA' equation of g CA' equation of g CA' x-value CA' y-value CA' equation of g	Mathematics P1 September 2017 6 NSC
4.2	$m \text{ of } g = 2$ $c = 2$	CA' gradient CA' y-intercept CA' equation of g CA' equation of g CA' x-value CA' y-value CA' equation of g	Mathematics P1 September 2017 6 NSC

QUESTIONS

7.1			$f(x+h) = 3(x+h)^2 - (x+h)$ $f(x) = 3x^2 + 6xh + 3h^2 - x - h$ $f(x+h) - f(x) = 6xh + 3h^2 - h$ $\frac{f(x+h) - f(x)}{h} = \frac{6xh + 3h^2 - h}{h} = 6x + 3h - 1$ $\lim_{h \rightarrow 0} (6x + 3h - 1) = 6x - 1$ OR $f(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ $= \lim_{h \rightarrow 0} \frac{3x^2 + 6xh + 3h^2 - x - h - (3x^2 - x)}{h}$ $= \lim_{h \rightarrow 0} \frac{6xh + 3h^2 - h}{h} = \lim_{h \rightarrow 0} (6x + 3h - 1) = 6x - 1$
7.2	7.2.1	$y = x^2 + 2x^2 + x^2 = 4x^2$ $\frac{dy}{dx} = 2x - 2x^2 - 4x^2$	CACACA ✓ ✓ ✓ ✓ ✓ answers A ✓ simplifying
7.2	7.2.2	$y = \sqrt{x} - \frac{1}{x^2} = x^{1/2} - x^{-2}$ $\frac{dy}{dx} = \frac{1}{2}x^{-1/2} - (-2)x^{-3} = \frac{1}{2\sqrt{x}} + \frac{2}{x^3}$	CA ✓ $\frac{1}{x^2}$ (provided rational)

(PENALISE ONCE ONLY FOR NOTATIONAL ERROR IN QUESTIONS 7, 8 AND 9)

QUESTION 7

6.1		$A = P(1+i)^n$ $8450 = P \left(1 + \frac{0.12}{12}\right)^{18}$ $P = R2560.31$	A ✓ formula A ✓ correct substitution
6.2		$A = P(1-i)^n$ $\frac{1}{2}P = P(1-0.047)^n$ $\frac{1}{2} = (1-0.047)^n$ $\log \frac{1}{2} = n \log(1-0.047)$ $n = 14.40$ years	A ✓ substitution correct M ✓ use of logs CA ✓ answer
6.3	6.3.1	$P = \frac{A}{1 + (1+i)^n}$ $P = \frac{950000}{1 + (1 + \frac{0.105}{12})^{144}}$ $P = R9484.61$ $950000 = x(100.622742)^{12}$ $x = R9484.61$	A ✓ value (independent of the formula) A ✓ substitution of P and i into correct formula A ✓ n (independent of the formula) CA ✓ simplification CA ✓ answer

QUESTION 8

5.5	5.2-1	OR $(-2x - 2) - 2 \geq 0$ $-2x - 2 \leq 0$ $-2x \leq 2$ $x \geq -1$	CA ✓ -1 OR A ✓ notation
	5.2-2		CACA ✓ ✓ ✓ ✓ ✓ answer

8.1		$p = 5$ since the y - intercept of the line is 5 $m = 5$ since the x - intercept of the line is 5 $A(-20)$ and the y - intercept is B(15)	A ✓ justification A ✓ justification
8.2		$y = (x+3)(x-1)(x-5)$ $= (x-3)(x^2 - 6x - 5)$ $= x^3 - 3x^2 - 6x - 5$ $\frac{dy}{dx} = 3x^2 - 6x - 5$ $3x^2 - 6x - 5 = 0$ $x = \frac{6 \pm \sqrt{(-6)^2 - 4(3)(-5)}}{2(3)}$ $x = \frac{6 \pm \sqrt{36 + 60}}{6}$ $x = \frac{6 \pm \sqrt{96}}{6}$ $x = \frac{6 \pm 4\sqrt{6}}{6}$ $x = 1 \pm \frac{2\sqrt{6}}{3}$	A ✓ expression for f CA ✓ derivative and equating to 0 CA ✓ substitution into formula CA ✓ correct y - value [CA negative y - value] CA ✓ x - values
8.3		$x \leq -3$ or $-1.715 \leq x \leq 3.31$ $x = 3.31$ or $-1.71$ $x = 3.31 \Rightarrow y = -24.63$	CA ✓ end points CA ✓ inequality

QUESTION 8

7.3.1		$f(x) = 2x + 8x^2 = 2x - \frac{x^2}{8}$ $m = f'(2) = 2(2) - \frac{2}{4} = 3.5$ $y = f(2) = 2(2) - \frac{2^2}{8} = 3.5$	A ✓ derivative CA ✓ substitution CA ✓ answer
7.3.2		$y = f(2) = 2(2) - \frac{2^2}{8} = 3.5$ $y = mx + c$ $3 = 5(2) + c$ $c = -7$ $y = 5x - 7$	A ✓ y value CA ✓ substituting point (2,3) CA ✓ answer
7.3.3		$y = 5x - 7$	CA ✓ answer

6.3.2		Balance on loan $A = P$ $9444.61 = P \left(1 + \frac{0.105}{12}\right)^{144}$ $P = \frac{9444.61}{\left(1 + \frac{0.105}{12}\right)^{144}}$ $P = R614287.19$	A ✓ formula A ✓ substitution of i A ✓ n value A ✓ substitution of P and x
6.3.3		$P = \frac{A}{1 + (1+i)^n}$ $P = \frac{9444.61}{1 + (1 + \frac{0.105}{12})^{144}}$ $P = R614287.19$	OR A ✓ formula OR A ✓ substitution of x A ✓ n value A ✓ substitution of i A ✓ n value CA ✓ answer

11.1	71 = 5040	A✓ answer	11.1	71 = 5040	A✓ answer
11.2	Girls seated together in 4! ways. With the girls as one unit they can all be seated in 4! ways = 576	A✓4! ways for girls A✓4! ways for others with girls A✓ answer	11.2	Girls seated together in 4! ways. With the girls as one unit they can all be seated in 4! ways = 576	A✓ answer
11.3	$\frac{576}{4} = 0.1425 = 14.25\%$	CA✓ answer	11.3	$\frac{576}{4} = 0.1425 = 14.25\%$	CA✓ answer
11.4	The girls can sit in $3 \times 2 \times 1$ ways. The boys can sit $3 \times 2 \times 1$ ways. Total no. of ways = $4! \times 3! = 144$ P(girl, boy, girl, etc.) = $\frac{144}{5040} = 0.028571$ = 2.86% OR $\frac{4}{3} \times \frac{3}{2} \times \frac{2}{1} \times \frac{3}{2} \times \frac{2}{1} \times \frac{1}{1} = 144$ ways P(girl, boy, girl, etc.) = $\frac{144}{5040} = 0.028571$ = 2.86%	A✓ method A✓144 A✓ answer	11.4	The girls can sit in $3 \times 2 \times 1$ ways. The boys can sit $3 \times 2 \times 1$ ways. Total no. of ways = $4! \times 3! = 144$ P(girl, boy, girl, etc.) = $\frac{144}{5040} = 0.028571$ = 2.86% OR $\frac{4}{3} \times \frac{3}{2} \times \frac{2}{1} \times \frac{3}{2} \times \frac{2}{1} \times \frac{1}{1} = 144$ ways P(girl, boy, girl, etc.) = $\frac{144}{5040} = 0.028571$ = 2.86%	A✓ method A✓144 A✓ answer

QUESTION 11

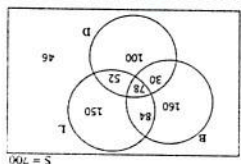
9.1	$r = \pi r^2$ $\pi r h = 450$ $h = \frac{450}{\pi r}$	A✓ formula A✓450 A✓ answer	9.1	$r = \pi r^2$ $\pi r h = 450$ $h = \frac{450}{\pi r}$	A✓ formula A✓450 A✓ answer
9.2	$A = 2\pi r^2 + 2\pi rh$ $= 2\pi r^2 + 2\pi r \left(\frac{450}{\pi r}\right)$	A✓ formula A✓ substituting h	9.2	$A = 2\pi r^2 + 2\pi rh$ $= 2\pi r^2 + 2\pi r \left(\frac{450}{\pi r}\right)$	A✓ formula A✓ substituting h
9.3	$r' = 4\pi r - 900r^{-2}$ $r' = 4\pi r - \frac{900}{r^2}$ $r' = 0$ for min. area $4\pi r - \frac{900}{r^2} = 0$ $4\pi r^3 - \frac{900}{r} = 0$ $r^4 = \frac{900}{4\pi}$ $r = \sqrt[4]{\frac{900}{4\pi}}$ $r = 4.15$ cm	CA✓ derivative A✓ derivative equal to 0	9.3	$r' = 4\pi r - 900r^{-2}$ $r' = 4\pi r - \frac{900}{r^2}$ $r' = 0$ for min. area $4\pi r - \frac{900}{r^2} = 0$ $4\pi r^3 - \frac{900}{r} = 0$ $r^4 = \frac{900}{4\pi}$ $r = \sqrt[4]{\frac{900}{4\pi}}$ $r = 4.15$ cm	CA✓ derivative A✓ derivative equal to 0

QUESTION 9

8.4	$6x - 6 < 0$ $6x < 6$ $x < 1$ A✓ second derivative < 0 CA✓ answer [CA only if value lies between x - values of 8.2]	A✓ second derivative < 0 CA✓ answer [CA only if value lies between x - values of 8.2]	8.4	$6x - 6 < 0$ $6x < 6$ $x < 1$ A✓ second derivative < 0 CA✓ answer [CA only if value lies between x - values of 8.2]	A✓ second derivative < 0 CA✓ answer [CA only if value lies between x - values of 8.2]
13.1	CA✓ value of x CA✓ second derivative CA✓ answer [CA only if value lies between x - values of 8.2]	OR $f'(x) = 6x - 6$ $6x - 6 = 0$ $x = 1$ $f$ is concave down when $x < 1$	13.1	CA✓ value of x CA✓ second derivative CA✓ answer [CA only if value lies between x - values of 8.2]	OR $f'(x) = 6x - 6$ $6x - 6 = 0$ $x = 1$ $f$ is concave down when $x < 1$

QUESTION 10

10.1	Venn diagram and its values	10.1	Venn diagram and its values
10.2.1	Put least one meal = $\frac{654}{700} = 0.93428$ CA✓ numerator A✓ denominator	10.2.1	Put least one meal = $\frac{654}{700} = 0.93428$ CA✓ numerator A✓ denominator
10.2.2	Put least one meal = $1 - \frac{46}{700} = \frac{327}{350} = 0.93428$ OR CA✓ numerator A✓ denominator	10.2.2	Put least one meal = $1 - \frac{46}{700} = \frac{327}{350} = 0.93428$ OR CA✓ numerator A✓ denominator
10.2.3	Exactly 2 meals = $\frac{166}{700} = \frac{83}{350} = 0.2371$ CA✓ numerator A✓ denominator	10.2.3	Exactly 2 meals = $\frac{166}{700} = \frac{83}{350} = 0.2371$ CA✓ numerator A✓ denominator



QUESTION 10

11.2	If $c = 2$ , $x = 4.56$ or $x = 0.44$	11.2	If $c = 2$ , $x = 4.56$ or $x = 0.44$
1.3	Candidate wrote $\sqrt[10]{(98)}$ award a mark	1.3	Candidate wrote $\sqrt[10]{(98)}$ award a mark
2.1.3	If $43x^2$ and $\frac{42}{x} - 123 = 2754$ award CA	2.1.3	If $43x^2$ and $\frac{42}{x} - 123 = 2754$ award CA
2.2.2	$S_x = 0.5n$ or $-3 < x < -1$	2.2.2	$S_x = 0.5n$ or $-3 < x < -1$
3.3	$2x^2 - 4x - 5 = 2n$ Proof via contradiction - accept	3.3	$2x^2 - 4x - 5 = 2n$ Proof via contradiction - accept
3.4	Alternative EF = $y - y_2$ and gets an expression in x and then substitute $x = \frac{1}{2}$	3.4	Alternative EF = $y - y_2$ and gets an expression in x and then substitute $x = \frac{1}{2}$
3.5	CA for -1 and A for notation.	3.5	CA for -1 and A for notation.
6.2	Don't have to show logs full marks	6.2	Don't have to show logs full marks
6.3.2	A - Future value of loan	6.3.2	A - Future value of loan
9.2	Use of wrong formula - CA marks will apply	9.2	Use of wrong formula - CA marks will apply
9.3	Use of wrong formula - CA marks will apply	9.3	Use of wrong formula - CA marks will apply

NOTES - Maths P1

TOTAL MARKS: 150

191			191		
(3)	A✓ answer	P(girl, boy, girl, etc.) = $\frac{144}{5040} = 0.028571 = 2.86\%$	(3)	A✓ answer	P(girl, boy, girl, etc.) = $\frac{144}{5040} = 0.028571 = 2.86\%$
(3)	A✓ method	Total number of ways = 144 Girl 4: $3! \times 3! = 36$ ways Girl 3: $3! \times 3! = 36$ ways Girl 2: $3! \times 3! = 36$ ways Girl 1: $3! \times 3! = 36$ ways The number of ways for each girl: OR P(girl, boy, girl, etc.) = $\frac{144}{5040} = 0.028571 = 2.86\%$	(3)	A✓ method	Total number of ways = 144 Girl 4: $3! \times 3! = 36$ ways Girl 3: $3! \times 3! = 36$ ways Girl 2: $3! \times 3! = 36$ ways Girl 1: $3! \times 3! = 36$ ways The number of ways for each girl: OR P(girl, boy, girl, etc.) = $\frac{144}{5040} = 0.028571 = 2.86\%$

QUESTION 11

9.1	$r = \pi r^2$ $\pi r h = 450$ $h = \frac{450}{\pi r}$	A✓ formula A✓450 A✓ answer	9.1	$r = \pi r^2$ $\pi r h = 450$ $h = \frac{450}{\pi r}$	A✓ formula A✓450 A✓ answer
9.2	$A = 2\pi r^2 + 2\pi rh$ $= 2\pi r^2 + 2\pi r \left(\frac{450}{\pi r}\right)$	A✓ formula A✓ substituting h	9.2	$A = 2\pi r^2 + 2\pi rh$ $= 2\pi r^2 + 2\pi r \left(\frac{450}{\pi r}\right)$	A✓ formula A✓ substituting h
9.3	$r' = 4\pi r - 900r^{-2}$ $r' = 4\pi r - \frac{900}{r^2}$ $r' = 0$ for min. area $4\pi r - \frac{900}{r^2} = 0$ $4\pi r^3 - \frac{900}{r} = 0$ $r^4 = \frac{900}{4\pi}$ $r = \sqrt[4]{\frac{900}{4\pi}}$ $r = 4.15$ cm	CA✓ derivative A✓ derivative equal to 0	9.3	$r' = 4\pi r - 900r^{-2}$ $r' = 4\pi r - \frac{900}{r^2}$ $r' = 0$ for min. area $4\pi r - \frac{900}{r^2} = 0$ $4\pi r^3 - \frac{900}{r} = 0$ $r^4 = \frac{900}{4\pi}$ $r = \sqrt[4]{\frac{900}{4\pi}}$ $r = 4.15$ cm	CA✓ derivative A✓ derivative equal to 0

QUESTION 9

8.4	$6x - 6 < 0$ $6x < 6$ $x < 1$ A✓ second derivative < 0 CA✓ answer [CA only if value lies between x - values of 8.2]	A✓ second derivative < 0 CA✓ answer [CA only if value lies between x - values of 8.2]	8.4	$6x - 6 < 0$ $6x < 6$ $x < 1$ A✓ second derivative < 0 CA✓ answer [CA only if value lies between x - values of 8.2]	A✓ second derivative < 0 CA✓ answer [CA only if value lies between x - values of 8.2]
13.1	CA✓ value of x CA✓ second derivative CA✓ answer [CA only if value lies between x - values of 8.2]	OR $f'(x) = 6x - 6$ $6x - 6 = 0$ $x = 1$ $f$ is concave down when $x < 1$	13.1	CA✓ value of x CA✓ second derivative CA✓ answer [CA only if value lies between x - values of 8.2]	OR $f'(x) = 6x - 6$ $6x - 6 = 0$ $x = 1$ $f$ is concave down when $x < 1$