CAPE WINELANDS
EDUCATION DISTRICT

GR 12

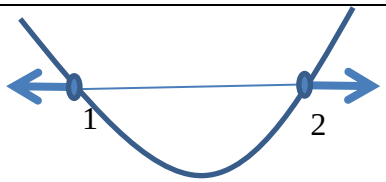
MATHEMATICS P1 / WISKUNDE V1
MEMORANDUM

SEPTEMBER 2017

MARKS: 150

QUESTION 1

1.1.1	$4x - x^3 = 0$ $x(4 - x^2) = 0$ $x(2 - x)(2 + x) = 0$ $\therefore x = 0\ ;\ x = \pm 2$	✓ *factorise* ✓$x = 0$ ✓$x = \pm 2$	(3)K
1.1.2	$\sqrt{4x} + 3 = x$ $\sqrt{4x} = x - 3$ $4x = x^2 - 6x + 9$ $x^2 - 10x + 9 = 0$ $(x - 1)(x - 9) = 0$ $x \neq 1\ ;\ \ x = 9$	✓ *standard form* ✓ *factors* ✓$x = 9$ ✓ $x \neq 1$	(4)R
1.1.3	$(2.2^x - 1)(2^x + 2) = 0$ $2^x = \frac{1}{2}\ \ ;\ \ 2^x \neq -2$ $x = -1$ *no solution*	✓$2^x = \frac{1}{2}$ ✓ $x = -1$ ✓ *no solution*	(3)K
1.2.1	$x^2 + x - 11 = 0$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $x = \frac{-(1) \pm \sqrt{(1)^2 - 4(1)(-11)}}{2(1)}$ $x = \frac{-1 \pm \sqrt{45}}{2}$ $x = 2{,}85\ \ ;\ \ x = -3{,}85$	✓*substitution into formula* ✓✓ *answers* **-1 for rounding**	(3) K
1.2.2	$f(x) = f'(x)$ $x^2 + x - 11 = 2x + 1$ $x^2 - x - 12 = 0$ $(x - 4)(x + 3) = 0$ $\therefore x = 4\ ; x = -3$	✓$f'(x) = 2x + 1$ ✓ *standard form* ✓ *factors* ✓ *answers*	(4) C
1.3	$y - 8x - 9 = 0$ $\therefore y = 8x + 9$ ……. (1) *and* $-x^2 + 4x + 5 - y = 0$ .....(2) *Subst*(1) *into* (2): $-x^2 + 4x + 5 - (8x + 9) = 0$ $-x^2 + 4x + 5 - 8x - 9 = 0$ $-x^2 - 4x - 4 = 0$ $x^2 + 4x + 4 = 0$ $(x + 2)^2 = 0$ $\therefore x = -2$ *Subst into* (1) $y = 8(-2) + 9 = \mathbf{-7}$	✓ $y = 8x + 9$ ✓ *substitution* ✓ *standard form* ✓ *factors* ✓ $x -$ *value* ✓ $y -$ *value*	(6) R
1.4.1	Real / Reëel Unequal / ongelyk	✓*answer* ✓*answer*	(2)K
1.4.2	$(k - 1)(2 - k) < 0$ $(k - 1)(k - 2) < 0$ $k < 1$ *or* $k > 2$	✓$(k - 1)(2 - k) < 0$ ✓critical values ✓ *answer*	(3) C **[28]**



QUESTION 2

2.1	$T_n = a + (n-1)d$ $36 + (n-1)(-11) = -52$ $36 - 11n + 11 = -52$ $-11n = -52 - 47$ $-11n = -99$ $n = 9$	✓ *sub a and d into correct formula* ✓ $= -52$ ✓ *answer*	(3) K
2.2	$\frac{1}{4}(2)^0 + \frac{1}{4}(2)^1 + \frac{1}{4}(2)^2 \ldots\ldots 8 terms$ $\frac{1}{4} + \frac{1}{2} + 1 \ldots\ldots$ $S_n = \frac{a(r^n - 1)}{r - 1}$ $S_n = \frac{\frac{1}{4}(2^8 - 1)}{2 - 1}$ $= \frac{1}{4}(256 - 1)$ $= \frac{255}{4}$ $= 63\frac{3}{4}$ *or* 63,75	✓ Expand the series ✓ *sub into correct formula* ✓ *answer*	(3) R
2.3.1	$a + b + c =$ ___ 8 ___ ___ $3a + b =$ 6 12 18 $2a =$ 6 6 2 ; 8 ; 20 ; 38	✓2 ✓20 ✓38 [-1 per error]	(3)P
2.3.2	$2a = 6$ $3a + b = 6$ $a + b + c = 2$ $a = 3$ $9 + b = 6$ $3 - 3 + c = 2$ $b = -3$ $c = 2$ $T_n = 3n^2 - 3n + 2$ $T_{40} = 3(40)^2 - 3(40) + 2$ $T_{40} = 3(40)^2 - 3(40) + 2$ $= 4682$	✓$a = 3$ ✓$b = -3$ ✓$c = 2$ ✓ *sub into correct formula* ✓*answer*	(5)R
			[14]

QUESTION 3

3.1.1	$r = \frac{x+3}{(x^2-9)} = \frac{-2}{(x+3)}$ $\frac{x+3}{(x+3)(x-3)} = \frac{-2}{(x+3)}$ $-2(x-3) = (x+3)$ $-2x+6 = x+3$ $-3x = -3$ $x = 1$	✓ $\frac{x+3}{(x^2-9)} = \frac{-2}{(x+3)}$ ✓ *factorise* ✓ *answer*	(3)R
3.1.2	$r = \frac{-2}{(1+3)} = -\frac{1}{2}$ $-1 < \frac{-1}{2} < 1$ $\therefore$ *reeks konvergeer ; series converge*	✓ $r = -\frac{1}{2}$ ✓ $-1 < r < 1$	(2)K
3.1.3	$-8\ ;\ 4\ ;\ -2$ $2S_n = -10$ $\frac{-8\left(\left(\frac{-1}{2}\right)^n - 1\right)}{\frac{-1}{2} - 1} = -5$ $\left(-\frac{1}{2}\right)^n - 1 = -\frac{15}{16}\ (-0{,}975)$ $(\frac{-1}{2})^n = +\frac{1}{16}$ $\therefore n = 4$	✓ $-8\ ;\ 4\ ;\ -2$ ✓ *sub into correct formula* ✓$(\frac{-1}{2})^n = -\frac{1}{8}$ ✓$n = 4$	(4)C
3.2	*Series Grey triangles* $= \frac{1}{4} + \left(\frac{1}{4}\ of\ \frac{1}{4}\right) + \frac{1}{4} of\ \frac{1}{16}$ $= \frac{1}{4} + \frac{1}{16} + \frac{1}{64} \ldots\ldots \infty$ $S_\infty = \frac{a}{1-r}$ $= \frac{\frac{1}{4}}{1-\frac{1}{4}}$ $= \frac{1}{4} \times \frac{4}{3} = \frac{1}{3}$ *Area of unshaded part* $= 1 - \frac{1}{3} = \frac{2}{3} unit^2$	✓*Expand* ✓*Subst in correct formula* ✓*Sum* ✓*Final solution*	(4)P
			[13]

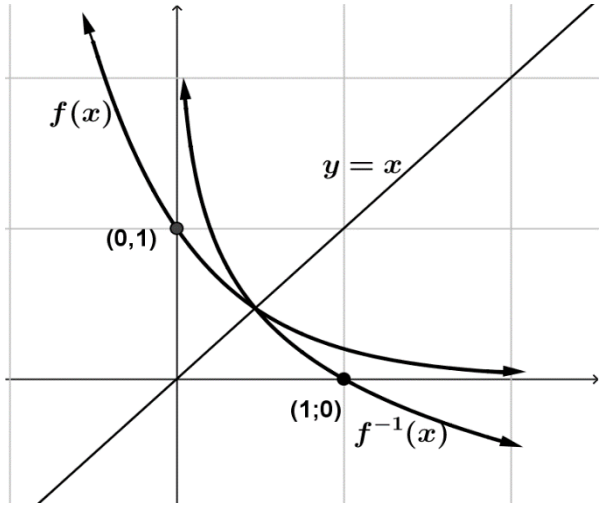
QUESTION 4

4.1	$p = 1$	✓ *answer*	(1)K
4.2	$4{,}5 = \frac{-3}{5+1} + q$ $4{,}5 = -\frac{1}{2} + q$ $q = 5$	✓ *substitution* ✓ *answer*	(2)R
4.3	$0 = \frac{-3}{x+1} + 5$ $-5 = \frac{-3}{x+1}$ $x+1 = \frac{3}{5}$ $x = -\frac{2}{5}$	✓ *substitution* ✓ *answer*	(2)K
4.4	$x = -5$	✓✓ answer	(2)R
4.5	$y = x + c$ $5 = -1 + c$ $c = 6$ $y = x + 6$	✓ increasing function ✓ substitution ✓ answer	(3)P
4.6	$x < -1$	✓✓ answer	(2)C
			[12]

QUESTION 5

5.1	$g(x) = -2x - 6$ $x - intercepts: -2x - 6 = 0$ $-2x = 6$ $x = -3$ $P(-3;0)$	✓ $g(x) = 0$ ✓ $value\ of\ x$ ✓ $P(-3;0)$	(3)K
5.2	$P(-3;0)$ and $Q(1;0)$ $f(x) = a(x+3)(x-1)$ $-3 = a(0+3)(0-1)$ $-3 = -3a$ $a = 1$ $f(x) = (x+3)(x-1)$ $= x^2 + 2x - 3$ OR R$(-1;y)$ ∴ $g(-1) = -2(-1) - 6$ $= -4$ R$(-1;-4)$ $y = a(x+p)^2 + q$ $y = a(x+1)^2 - 4$ $y = a(x^2 + 2x + 1) - 4$ $y = ax^2 + 2ax + a - 4$ $Substitute(0;-3)$ $a(1) - 4 = -3$ $a = 1$ $y = x^2 + 2x + 1 - 4$ $y = x^2 + 2x - 3$	✓ $intercept\ form$ ✓ $substitution$ ✓ $value\ of\ a$ [-1 if a is not used] ✓ $y - value\ of\ R$ ✓ $substitution$ ✓ $value\ of\ a$ **[-1 if a is not used]**	(3)R
5.3	TW $= x^2 + 2x - 3 - (-2x - 6)$ $= x^2 + 4x + 3$ $= (2)^2 + 4(2) + 3$ = 15 units	✓ length in terms of x ✓ substitution ✓ answer	(3)C
5.4.1	$f'(x) = 2x + 2$ $-2 = 2x + 2$ $-4 = 2x$ $x = -2$ $f(-2) = (-2)^2 + 2(-2) - 3$ $= -3$	✓ $derivative$ ✓ $subst\ gradient$ ✓ $x = -2$ ✓ $y = -3$	(4)P
5.4.2	$m_{tan} = -2$ $y = -2x + c$ $-3 = -2(-2) + c$ $c = -7$ equation of tangent : $y = -2x - 7$ $\therefore k = -1$	✓ value of c ✓ answer	(2) P
			[15]

QUESTION 6

6.1	$y = \log_{\frac{1}{5}} x$	✓ answer	(1)K
6.2		f: ✓ (0;1) ✓ shape f^{-1}: ✓ (1;0) ✓ shape	(4)R
6.3	$x > 0; x \in R$	✓✓ answer **DO NOT PENALIZE IF $x \in R$ IS OMITTED**	(2)K
6.4	$0 < x \leq 1; x \in R$	✓✓ answer **DO NOT PENALIZE IF $x \in R$ IS OMITTED**	(2)P
6.5	$y < -3; y \in R$	✓✓ answer **DO NOT PENALIZE IF $x \in R$ IS OMITTED**	(2)P
			[11]

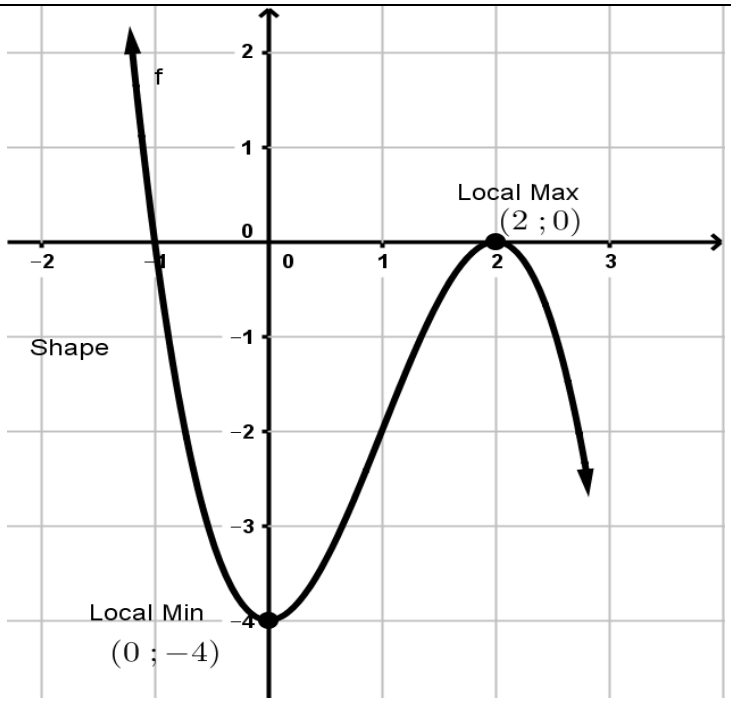
VRAAG7

7.1	$A = P(1-i)$ $A = 30\,000\left(1-\frac{9}{100}\right)^{7}$ $A = 15\,502{,}83$	✓ *sub into correct formula* ✓ *answer*	(2)R
7.2	$F = \frac{x\left[(1+i)^{n}-1\right]}{i}$ $100\,000 = \frac{x[(1+\frac{10{,}05}{1200})^{61}-1]}{\frac{10{,}05}{1200}}$ $x = 100\,000 \div 79{,}188\ldots..$ $x = R\ 1\,262{,}80$	✓ $n = 61$ ✓ $i = \frac{10{,}05}{1200}$ ✓ *sub into correct formula* ✓ *answer*	(4) R
7.3	$P = \frac{x[1-(1+i)^{-n}]}{i}$ $2\,500\,000 = \frac{20\,000[1-(1+\frac{8}{1200})^{-12n}]}{\frac{8}{1200}}$ $\frac{5}{6} = 1-(\frac{151}{150})^{-12n}$ $-\frac{1}{6} = -(\frac{151}{150})^{-12n}$ $-12n = \log_{\frac{151}{150}}\frac{1}{6}$ $12n = 269{,}658808\ldots$ $n = 22{,}47\ years$	✓ *sub into correct formula* ✓ $i = \frac{8}{1200}$ ✓*use of logs* ✓*answer*	(4) C
7.4	$P = \frac{x[1-(1+i)^{-n}]}{i}$ $Balans = \frac{2\,000[1-(1+\frac{18}{1200})^{-10}]}{\frac{18}{1200}}$ $R18\,444{,}37$	✓ *sub into correct formula* ✓ $n = -10$ ✓*answer*	(3) C
			[13]

QUESTION 8

8.1	$f'(x) = \lim_{h\to 0}\frac{f(x+h)-f(x)}{h}$ $= \lim_{h\to 0}(\frac{-3}{x+h}+\frac{3}{x})\times\frac{1}{h}$ $= \lim_{h\to 0}\frac{-3x+3(x+h)}{x(x+h)}\times\frac{1}{h}$ $= \lim_{h\to 0}\frac{-3x+3x+3h}{xh(x+h)}$ $= \lim_{h\to 0}\frac{3h}{xh(x+h)}$ $= \lim_{h\to 0}\frac{3}{x(x+h)}$ $= \frac{3}{x^2}$	✓ substitution ✓ simplification ✓ factors ✓answer	(4) C
8.2.1	$f(x) = (x+3)^2$ $f(x) = x^2+6x+9$ $f'(x) = 2x+6$	✓ *expand* ✓✓ *answer*	(3)R
8.2.2	$f'(3) = 2(3)+6$ $= 12$	✓ *sub* 3 *into* $f'(x)$ ✓ *answer*	(2)R
8.3	$D_x\left[6x^{\frac{2}{3}}+4x^{-1}-\pi x^3\right]$ $= 4x^{-\frac{1}{3}}-4x^{-2}-3\pi x^2$	✓ simplify ✓ ✓✓ each term	(4) R
8.4	$f'(x) = 3ax^2-24$ $3ax^2-24=0$ $3a(4)=24$ $a=2$ $f(-2) = 2(-2)^3-24(-2)+b$ $-16+48+b = 17$ $b = 17-32$ $b = -15$	✓$f'(x)=0$ ✓value of a ✓ substitute point into f ✓ value of b	(4) C
			[17]

QUESTION 9

9.1.1	$f'(x) = 3x^2 + 6x$ $-3x(x-2) = 0$ $x = 0 \text{ or } x = 2$	✓ $derivative = 0$ ✓ $factors$ ✓ $answer$	(3) K
9.1.2	$f''(x) = 0$ $-6x + 6 = 0$ $x = 1$	✓ $answer$	(1) K
9.1.3		✓✓ $turning\ Points$ ✓ $shape$	(3) P
9.2.1	$Max: \frac{dV}{dt} = 0$ $V = -100t^2 + 200t + 2400$ $-200t + 200 = 0$ $-200t = -200$ $t = 1$ $\therefore After\ 1\ week$	✓ $derivative = 0$ ✓ $derivative$ ✓ $answer$	(3) C
9.2.2	Tank will be empty : $V = 0$ $-100t^2 + 200t + 2400 = 0$ $t^2 - 2t - 24 = 0$ $(t-6)(t+4) = 0$ $t = 6 \quad t \neq -4$ Tank will be empty after 6 weeks	✓ $V = 0$ ✓ $factors$ ✓ $answer$	(3) R
9.2.3	$\frac{dV}{dt} = -200t + 200$ $V'(3) = -200(3) + 200$ $= -400$ Volume decrease at $400l$ in a week.	✓ $substitution$ ✓ $answer$	(2) R
			[15]

QUESTION 10

10.1.1	$P(A\ or\ B) = P(A) + P(B) - P(A\ and\ B)$ $P(A\ and\ B) = P(A) + P(B) - P(A\ or\ B)$ $= 0{,}45 + 0{,}3 - 0{,}615$ $= 0{,}135$ $P(A\ and\ B) \neq 0\ \ NOT\ mutually\ exclusive$	✓ substitution into formula ✓ answer ✓ conclusion	(3)R
10.1.2	$P(A).P(B) = (0{,}45)(0{,}3)$ $= 0{,}135$ $P(A\ and\ B) = 0{,}135$ Therefore the events are independant.	✓ answer $P(A).P(B)$ ✓ value $P(A\ and\ B)$ ✓ conclusion	(3)R
10.2.1	8! $= 40\ 320$	✓ 8!	(1)K
10.2.2	$7! \times 2!$ =10 080	✓ $7! \times 2!$ ✓ *answer*	(2) R
10.3	$\text{P(Start L)} = \frac{8!}{3! \times 2!} \div \frac{9!}{4! \times 2!}$ $= \frac{4}{9}$ OR 0,4444 OR 44,44%	✓ $\frac{8!}{3! \times 2!}$ numerator ✓ denominator ✓ answer	(3)C
			[12]