

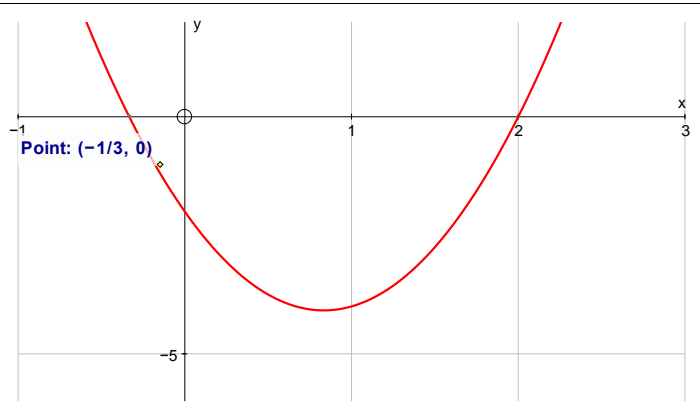
Grade 12 Mathematics Paper 1 2015 – MEMO

QUESTION 1		
1.1.1	$12 - x - x^2 = -8$ $0 = x^2 + x - 20$ $0 = (x + 5)(x - 4)$ $x = -5 \quad \text{or} \quad x = 4$	<ul style="list-style-type: none"> <li>• <math>12 - x - x^2 = -8</math></li> <li>• <math>0 = (x + 5)(x - 4)</math></li> <li>• <math>x = -5; 4</math></li> </ul> <p style="text-align: right;">(3)</p>
1.1.2	$LCD: (x - 2)(x + 2)$ $x + 6 - 2(x + 2) = -(x - 2)$ $x + 6 - 2x - 4 = -x + 2$ $0 = 0$ $\therefore x \in R; \quad x \neq \pm 2$	<ul style="list-style-type: none"> <li>• LCD</li> <li>• Numerator</li> <li>• <math>0 = 0</math></li> <li>• <math>x \in R</math></li> <li>• <math>x \neq \pm 2</math></li> </ul> <p style="text-align: right;">(5)</p>
1.1.3	$x^2 - 9 > 0$ $(x - 3)(x + 3) > 0$ $x < -3 \quad \text{or} \quad x > 3$	<ul style="list-style-type: none"> <li>• <math>x^2 - 9 &gt; 0</math></li> <li>• Method</li> <li>• <math>x &lt; -3</math></li> <li>• <math>x &gt; 3</math></li> </ul> <p style="text-align: right;">(4)</p>
1.1.4	$2^x \left( \frac{1}{4} + 1 + 2 \right) = 52$ $2^x = 16$ $2^x = 2^4$ $x = 4$	<ul style="list-style-type: none"> <li>• <math>2^x</math></li> <li>• <math>\frac{1}{4} + 1 + 2</math></li> <li>• <math>2^x = 16</math></li> <li>• <math>x = 4</math></li> </ul> <p style="text-align: right;">(4)</p>
1.2	$\sqrt{\frac{5^{2012}(5^2 - 1)}{6}} = \sqrt{\frac{5^{2012}(24)}{6}} = 2 \cdot 5^{1006}$ $a = 2$ $b = 1006$	<ul style="list-style-type: none"> <li>• <math>5^{2012}</math></li> <li>• <math>(5^2 - 1)</math></li> <li>• <math>a = 2</math></li> <li>• <math>b = 1006</math></li> </ul> <p style="text-align: right;">(4)</p>
1.3	$x = 2y + 2$ $y = [(2y + 2) + 1][(2y + 2) - 3]$ $y = (2y + 3)(2y - 1)$ $y = 4y^2 + 4y - 3$ $0 = 4y^2 + 3y - 3$ $y = \frac{-(-3) \pm \sqrt{(-3)^2 - 4(4)(-3)}}{2(4)}$ $y = 0,57 \quad \text{or} \quad y = -1,32$ $x = 3,14 \quad \quad \quad x = -0,64$	<ul style="list-style-type: none"> <li>• subs <math>x = 2y + 2</math></li> <li>• simplify <math>(2y + 3)(2y - 1)</math></li> <li>• <math>0 = 4y^2 + 3y - 3</math></li> <li>• Subs in formula</li> <li>• <math>y = 0,57 \quad \text{or} \quad y = -1,32</math></li> <li>• <math>x = 3,14 \quad \quad \quad x = -0,64</math></li> </ul> <p style="text-align: right;">(6)</p>

QUESTION 2		
2.1.1	$a = 2$ $b = -5$ $c = -4$ $T_n = 2n^2 - 5n - 4$	1 mark each in Tn  (3)
2.1.2	$2n^2 - 5n - 4 = 22n - 17$ $2n^2 - 27n + 13 = 0$ $(2n - 1)(n - 13) = 0$ $n = 13$ $\therefore T_{13} = 22(13) - 17 = 269$	<ul style="list-style-type: none"> <li>• CA - equating</li> <li>• <math>n = 13</math></li> <li>• CA - <math>T_{13} = 269</math></li> </ul> (3)
2.2.1	$200 = 5 + (n - 1)(5)$ $200 = 5 + 5n - 5$ $40 = n$	<ul style="list-style-type: none"> <li>• <math>a = 5</math> <math>d = 5</math></li> <li>• <math>T_n = 200</math></li> <li>• <math>n = 40</math></li> </ul> (3)
2.2.2	$S_{40} = \frac{40}{2} [2(5) + (40 - 1)(5)] = 4100$	<ul style="list-style-type: none"> <li>• CA - subs <math>n = 40</math></li> <li>• Subs <math>a = 5</math> <math>d = 5</math></li> <li>• <math>S_{40} = 4100</math></li> </ul> (3)
2.2.3	$S_{whole} - S_{40}$ $= \left[ \frac{200}{2} (2(1) + (200 - 1)(1)) \right] - 4100$ $= 20100 - 4100$ $= 16000$	<ul style="list-style-type: none"> <li>• <math>\left[ \frac{200}{2} (2(1) + (200 - 1)(1)) \right]</math></li> <li>• 20100</li> <li>• <math>S_{whole} - S_{40} = 16000</math></li> </ul> (3)
2.3	$S_n = a + ar + ar^2 + \dots + ar^{n-1}$ $rS_n = ar + ar^2 + \dots + ar^{n-1} + ar^n$ <hr/> $S_n - rS_n = a - ar^n$ $S_n(1 - r) = a(1 - r^n)$ $S_n = \frac{a(1 - r^n)}{1 - r}$	<ul style="list-style-type: none"> <li>• Row 1</li> <li>• Row 2</li> <li>• Subtraction</li> <li>• factorising</li> </ul> (4)
2.4.1	$S_\infty = \frac{23}{1 - 0,5} = 46$	<ul style="list-style-type: none"> <li>• subs <math>a = 23</math> <math>r = 0.5</math></li> <li>• <math>S_\infty = 46</math></li> </ul> (2)
2.4.2	$46 - \frac{23(1 - 0,5^n)}{1 - 0,5} > 2$ $44 > \frac{23(1 - 0,5^n)}{0,5}$ $\frac{22}{23} > 1 - 0,5^n$ $0,5^n > \frac{1}{23}$ $n > \frac{\log \frac{1}{23}}{\log 0,5} = 4,52 ; 5$	<ul style="list-style-type: none"> <li>• <math>\frac{23(1 - 0,5^n)}{1 - 0,5}</math></li> <li>• <math>0,5^n &gt; \frac{1}{23}</math></li> <li>• <math>n &gt; \frac{\log \frac{1}{23}}{\log 0,5}</math></li> <li>• 4,52 ; 5</li> </ul> (4)

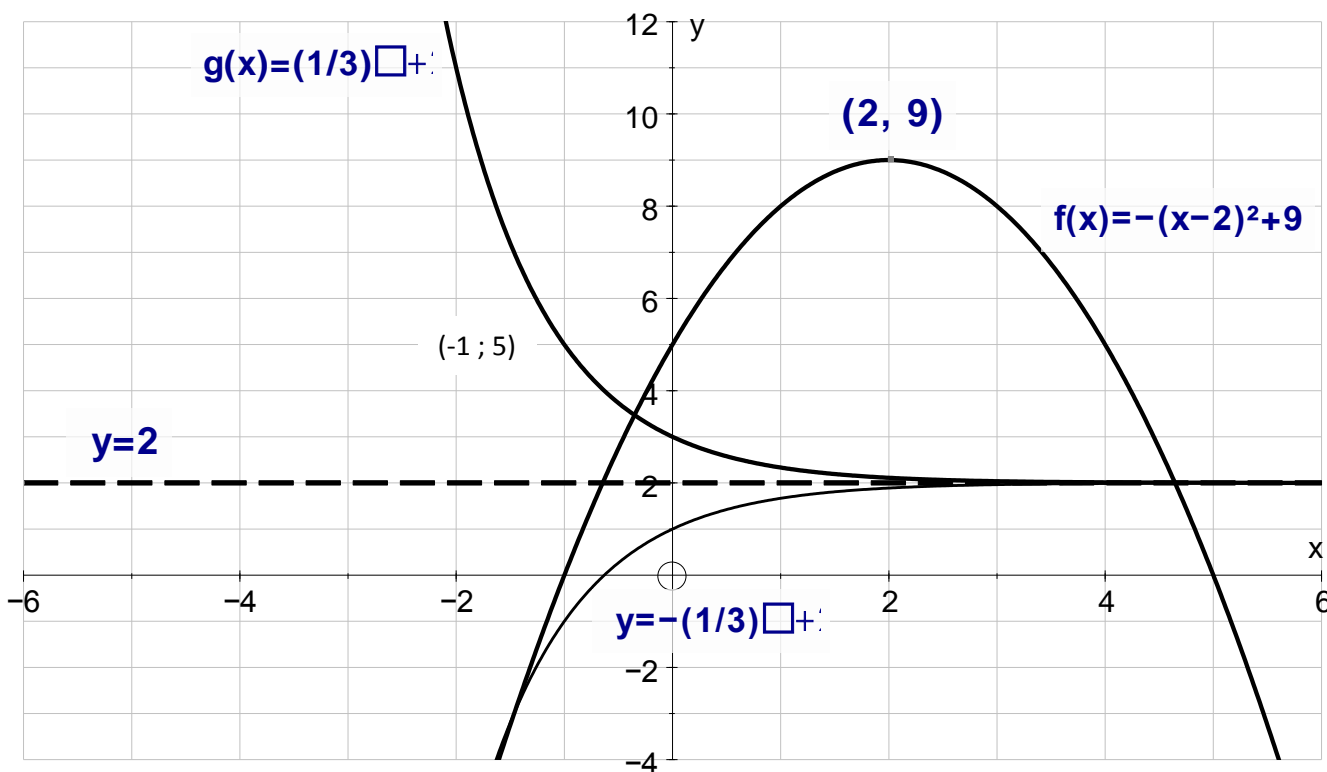
QUESTION 3		
3.1.1	$1 + i_{eff} = \left(1 + \frac{0.12}{12}\right)^{12}$ $i_{eff} = \left(1 + \frac{0.12}{12}\right)^{12} - 1 = 0.12682\dots$ $r = 12,68\%$	<ul style="list-style-type: none"> <li>Subs into formula</li> <li><math>r = 12,68\%</math></li> </ul> <p style="text-align: right;">(2)</p>
3.1.2	$2 = (1 + 0.12682\dots)^n$ $n = \frac{\log 2}{\log(1 + 0.12682\dots)} = 5,81\text{yrs} ; 6\text{yrs}$	<ul style="list-style-type: none"> <li>subs</li> <li><math>n = 6</math></li> </ul> <p style="text-align: right;">(2)</p>
3.2	$400000 = \frac{x \left[ \left(1 + \frac{0.09}{12}\right)^{37} - 1 \right]}{\frac{0.09}{12}}$ $x = \frac{400000 \left( \frac{0.09}{12} \right)}{\left[ \left(1 + \frac{0.09}{12}\right)^{37} - 1 \right]} = 9420.33$	<ul style="list-style-type: none"> <li><math>i = \frac{0.09}{12}</math></li> <li><math>n = 37</math></li> <li>Fv = 400 000</li> <li>9420.33</li> </ul> <p style="text-align: right;">(4)</p>
3.3.1	$P_v = 100000 = \frac{x \left[ 1 - \left(1 + \frac{0.15}{12}\right)^{-24} \right]}{\frac{0.15}{12}}$ $x = 4848.66$	<ul style="list-style-type: none"> <li><math>i = \frac{0.15}{12}</math></li> <li><math>n = -24</math></li> <li><math>x = 4848.66</math></li> </ul> <p style="text-align: right;">(3)</p>
3.3.2	$BO = \frac{4848.66 \left[ 1 - \left(1 + \frac{0.15}{12}\right)^{-14} \right]}{\frac{0.15}{12}} = 61920.07$	<ul style="list-style-type: none"> <li>CA – subs 4848.66 &amp; i</li> <li>N = -14</li> <li>BO = 61920.07</li> </ul> <p style="text-align: right;">(3)</p>
QUESTION 4		
4.1	See last page	
4.2	$k = 5$	<ul style="list-style-type: none"> <li><math>K = 5</math></li> </ul> <p style="text-align: right;">(2)</p>
4.3	$y = -1$	<ul style="list-style-type: none"> <li>Y</li> <li><math>= -1</math></li> </ul> <p style="text-align: right;">(2)</p>
4.4.1	See last page	
4.4.2	$y = -\left(\frac{1}{3}\right)^x + 2$	<ul style="list-style-type: none"> <li>Neg</li> <li><math>\left(\frac{1}{3}\right)^x</math> or <math>3^{-x}</math></li> <li>+2</li> </ul> <p style="text-align: right;">(3)</p>
QUESTION 5		
5.1.1	$-\frac{1}{4} = \frac{-2}{k+3}$ $k+3 = 8$ $k = 5$	<ul style="list-style-type: none"> <li>Subs into eqn</li> <li><math>K = 5</math></li> </ul> <p style="text-align: right;">(2)</p>
5.1.2	$x = -3$ $y = 0$	<ul style="list-style-type: none"> <li><math>X = -3</math></li> <li><math>Y = 0</math></li> </ul> <p style="text-align: right;">(2)</p>

5.1.3	$y = -(x+3) = -x-3$	<ul style="list-style-type: none"> <li>M = -1</li> <li>C = -3</li> </ul>	(2)	
5.1.4	$y \in R; y \neq 2$	<ul style="list-style-type: none"> <li><math>y \in R</math></li> <li><math>y \neq 2</math></li> </ul>	(2)	
5.2.1	$2 = \log_m 9$ $m^2 = 9$ $m = 3$	<ul style="list-style-type: none"> <li>Subs pt (9;2)</li> <li>Exp form</li> <li>M = pos 3</li> </ul>	(3)	
5.2.2	$y = \log_3 x \Rightarrow 3^y = x$ $y = 3^x$	<ul style="list-style-type: none"> <li>Interchange x &amp; y</li> <li><math>y = 3^x</math></li> </ul>	(2)	
5.2.3	$g(x) = -\log_3 x / \log_3 \frac{1}{x}$	$-\log_3 x / \log_3 \frac{1}{x}$	(2)	
5.2.4	$0 < x \leq 1$	<ul style="list-style-type: none"> <li>Limits incl ineq</li> </ul>	(2)	
5.2.5	$x = 2$	<ul style="list-style-type: none"> <li>2</li> </ul>	(1)	
<b>QUESTION 6</b>				
6.1	$f(x+h) = 2(x+h)^2 - 1 = 2(x^2 + 2xh + h^2) - 1$ $f'(x) = \lim_{h \rightarrow 0} \frac{2x^2 + 4xh + 2h^2 - 1 - (2x^2 - 1)}{h}$ $f'(x) = \lim_{h \rightarrow 0} \frac{4xh + 2h^2}{h}$ $f'(x) = \lim_{h \rightarrow 0} \frac{h(4x + 2h)}{h}$ $f'(x) = 4x + 2(0)$ $f'(x) = 4x$	<ul style="list-style-type: none"> <li>Simplify f(x+h)</li> <li>Subs into formula</li> <li>factorise</li> <li><math>f'(x) = -4x</math></li> </ul>	(4)	
6.2.1	$y = \frac{1}{3}x^2 + 4x \cdot x^{-\frac{1}{2}} = \frac{1}{3}x^2 + 4x^{\frac{1}{2}}$ $\frac{dy}{dx} = \frac{2}{3}x + 2x^{-\frac{1}{2}} = \frac{2}{3}x + \frac{2}{x^{\frac{1}{2}}}$	<ul style="list-style-type: none"> <li><math>y = \frac{1}{3}x^2 + 4x^{\frac{1}{2}}</math></li> <li><math>\frac{2}{3}x</math></li> <li><math>\frac{2}{x^{\frac{1}{2}}}</math></li> </ul>	(3)	
6.2.2	$y = \pm\sqrt{(x^2 - 2)^2}$ $y = x^2 - 2$ $\frac{dy}{dx} = 2x$	<ul style="list-style-type: none"> <li><math>(x^2 - 2)^2</math></li> <li>Square root</li> <li><math>\frac{dy}{dx} = 2x</math></li> </ul>	(3)	
6.3	$3 = a(2)^2 + \frac{b}{(2)}$ $3 = 4a + \frac{b}{2}$ $6 = 8a + b$ $6 - 8a = b$	and $f'(2) = 0$ $2a(2) - \frac{b}{(2)^2} = 0$ $4a - \frac{b}{4} = 0$ $16a - b = 0$	<ul style="list-style-type: none"> <li>Subs (2 ; 3) into f(x)</li> <li>subs (2) into f'(x)</li> <li>f'(x)=0</li> <li>simultaneous eqn</li> <li>a = 12</li> <li>b = -10</li> </ul>	(6)

	$16a - (6 - 8a) = 0$ $24a = 6$ $a = \frac{1}{4}$ $b = 4$	
<b>QUESTION 7</b>		
<b>7.1</b>	$f(x) = (2x-1)(x^2 - 2x - 3)$ $f(x) = 2x^3 - 5x^2 - 4x + 3$ $f'(x) = 6x^2 - 10x - 4 = 0$ $(3x+1)(x-2) = 0$ <p>At A : <math>x = 2</math></p> $f(2) = 2(2)^3 - 5(2)^2 - 4(2) + 3 = -9$ $A(2; -9)$	<ul style="list-style-type: none"> <li>• <math>f(x) = 2x^3 - 5x^2 - 4x + 3</math></li> <li>• <math>f'(x) = 6x^2 - 10x - 4</math></li> <li>• <math>(3x+1)(x-2) = 0</math></li> <li>• <math>f(2) = 2(2)^3 - 5(2)^2 - 4(2) + 3</math></li> <li>• <math>A(2; -9)</math></li> </ul> <p>(5)</p>
<b>7.2</b>	$f''(x) = 12x - 10 = 0$ $x = \frac{5}{6}$	<ul style="list-style-type: none"> <li>• <math>f''(x) = 0</math></li> <li>• <math>x = \frac{5}{6}</math></li> </ul> <p>(2)</p>
<b>7.3</b>		<ul style="list-style-type: none"> <li>• X-ints @ 2 &amp; <math>-\frac{1}{3}</math></li> <li>• Positive shape</li> </ul> <p>(2)</p>
<b>7.4</b>	$-\frac{1}{3} \leq x \leq 2$	<ul style="list-style-type: none"> <li>• Boundaries</li> <li>• inequalities</li> </ul> <p>(2)</p>
<b>7.5</b>	$PQ = 3x + 1 - (2x^3 - 5x^2 - 4x + 3)$ $PQ = -2x^3 + 5x^2 + 7x - 2$ $PQ' = -6x^2 + 10x + 7 = 0$ $x = 2.2$	<ul style="list-style-type: none"> <li>• subtraction</li> <li>• simplifying</li> <li>• derivative = 0</li> <li>• <math>x = 2.2</math></li> </ul> <p>(4)</p>
<b>QUESTION 8</b>		
<b>8.1</b>	$r^2 = 15^2 - h^2 \text{ (pythag)}$	<ul style="list-style-type: none"> <li>• <math>r^2 = 15^2 - h^2</math> or <math>r = \sqrt{15^2 - h^2}</math></li> </ul> <p>(2)</p>
<b>8.2</b>	$V = \frac{1}{3}\pi(225 - h^2)h = 75\pi h - \frac{1}{3}\pi h^3$ $\frac{dV}{dh} = 75\pi - h^2 = 0$ $h = \sqrt{75\pi} = 15.35\text{cm}$	<ul style="list-style-type: none"> <li>• Subs r</li> <li>• Derivative = 0</li> <li>• <math>H = 15.35</math></li> </ul> <p>(3)</p>
<b>QUESTION 9</b>		
<b>9.1.1</b>	See answer sheet	

<b>9.1.2</b>	$\frac{70}{120} = \frac{7}{12}$ ; 0.58	<ul style="list-style-type: none"> <li>• Numerator</li> <li>• Denominator (2)</li> </ul>
<b>9.1.3</b>	$P(\text{male}) \times P(\text{downloading}) = \frac{120}{210} \times \frac{110}{210} = \frac{44}{147}$ $P(\text{male and downloading}) = \frac{70}{120} = \frac{7}{12}$ $P(\text{male}) \times P(\text{downloading}) \neq P(\text{male and downloading})$ $\therefore$ not independent	<ul style="list-style-type: none"> <li>• <math>\frac{120}{210}</math></li> <li>• <math>\frac{110}{210}</math></li> <li>• <math>\frac{44}{147} \neq \frac{7}{12}</math></li> <li>• Not independent (4)</li> </ul>
<b>9.2.1</b>		<ul style="list-style-type: none"> <li>• probability event 1</li> <li>• Probability event 2</li> <li>• Outcomes (3)</li> </ul>
<b>9.2.2</b>	$0.6 \times 0.6 + 0.4 \times 0.5 = \frac{14}{25} = 0.56$	<ul style="list-style-type: none"> <li>• <math>0.6 \times 0.6</math></li> <li>• <math>0.4 \times 0.5</math></li> <li>• <math>\frac{14}{25} = 0.56</math> (3)</li> </ul>

**QUESTION 4.1 and 4.4.1**



TP ; y-intercept ; 2 x-ints

(-1) if not labelled with eqns

asymptote labelled ; y-int at 3 ; other point

(7)

y-in at 1 ; shape approaching asymptote

(2)

**QUESTION 9.1.1**

	Females	Males	Total
Downloaded Candy Crush	40	70	110
Did not download CC	50	50	100
<b>Total</b>	90	120	<b>210</b>

(3)