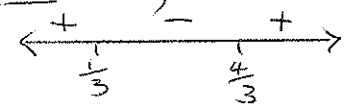
Grade 12 Mathematics Paper I Memo 2017

Section A

1) $2x^2 - 5x - 12 = 0$
$(2x+3)(x-4) = 0$
$x = -\frac{3}{2}$ or $x = 4$ (3)

2) $2\sqrt{x} = 8 - x$
$4x = 64 - 16x + x^2$
$0 = x^2 - 20x + 64$
$0 = (x-4)(x-16)$
$x = 4$; $x \neq 16$ (5)

3) $9x^2 - 12x + 4 > 3x$
$9x^2 - 15x + 4 > 0$
$(3x-1)(3x-4) > 0$
C/S $\frac{1}{3}$; $\frac{4}{3}$



$x < \frac{1}{3}$ or $x > \frac{4}{3}$ (5)

b) $y = x + 4$
$x + 4 = 2x^2 + 6x - 8$
$0 = 2x^2 + 5x - 12$
$0 = (2x-3)(x+4)$
$x = \frac{3}{2}$ or $x = -4$
$\therefore y = 5\frac{1}{2}$ or $y = 0$ (6)

c1) $5^x = 2$ and $5^y = 3$ (2)

2) $5^{3x} + 5^{2y}$
$= (5^x)^3 + (5^y)^2$
$= 2^3 + 3^2$
$= 17$ (3)

[24]

2a1) $p = -13$ (1)

2) $-1 \quad -7 \quad -11 \quad -13$
$\quad -6 \quad -4 \quad -2$
$\quad\quad 2 \quad\quad 2$

$2a = 2$
$\therefore a = 1$
$3a + b = -6$
$3 + b = -6$
$b = -9$
$a + b + c = -1$
$1 - 9 + c = -1$
$c = 7$
$\therefore T_n = n^2 - 9n + 7$ (4)

b) $2x + 1 - (2 + x) = x + 4 - (2x + 1)$
$x - 1 = -x + 3$
$2x = 4$
$x = 2$
$\therefore 4; 5; 6 \ldots$
$\therefore d = 1$ (4)

(2)

2c) $r = 2$; $S_6 = -3$
$a(2^6 - 1) = -3$
$2 - 1$
$a = \frac{-3}{63}$
$a = -\frac{1}{21}$ (3)

d1) $= \frac{x^2 + x}{x}$
$r = x + 1$
$\therefore -1 < x + 1 < 1$
$-2 < x < 0$ (3)

2) $S_\infty = \frac{x}{1 - (x+1)}$
$= -1$ (2)

[17]

3a) $85\% \times R800\,000$
$= R680\,000$
$680\,000 = \frac{x\left[1 - \left(1 + \frac{9{,}5\%}{12}\right)^{-240}\right]}{\frac{9{,}5\%}{12}}$

$x = \frac{680\,000 \times \frac{9{,}5\%}{12}}{\left[1 - \left(1 + \frac{9{,}5\%}{12}\right)^{-240}\right]}$
$x = R6338{,}49$ (5)

b) $R6338{,}49 \times 240 + R120\,000$
$= R1\,641\,237{,}60$ (2)

c) $B = 6338{,}49\left[1 - \left(1 + \frac{9{,}5\%}{12}\right)^{+x}\right]$
$\frac{9{,}5\%}{12}$

$= R566\,659{,}00$ (3)

d) Amount paid
$= R6338{,}49 \times 84$
$= R532\,433{,}16$
Portion of loan paid
$= R680\,000 - 566\,695$
$= R113\,305$
$\therefore$ Interest $= R419\,128{,}16$ (4)

[14]

4a) $f(x) = a.b^x$
$1 = a.b^0$
$\therefore a = 1$
$\frac{9}{4} = b^2$
$\therefore b = 3/2$
$f(x) = \left(\frac{3}{2}\right)^x$ (3)

b) $4 = \left(\frac{3}{2}\right)^d$
$\log 4 = d \log 3/2$
$\frac{\log 4}{\log(3/2)} = d$
$d = 3{,}4$ (3)

c) $h(x) = -\left(\frac{3}{2}\right)^x$ (1)

d) $y < 0$ (1)

e) $g(x) = \log_{3/2} x$ (2)

[10]

a) $f(x) = -\frac{1}{2}x^2 + 2x$

$f(x+h) = -\frac{1}{2}(x+h)^2 + 2(x+h)$

$f'(x) = \lim_{h\to 0} \frac{-\frac{1}{2}(x^2+2xh+h^2)+2x+2h-(-\frac{1}{2}x^2+2x)}{h}$

$= \lim_{h\to 0} \frac{-\frac{1}{2}x^2 - xh - \frac{1}{2}h^2 + 2x + 2h + \frac{1}{2}x^2 - 2x}{h}$

$= \lim_{h\to 0} \frac{(-xh - \frac{1}{2}h^2 + 2h)}{h}$

$= \lim_{h\to 0} (-x - \frac{1}{2}h + 2)$

$f'(x) = \underline{-x+2}.$ (5)

b) $y = 3x^2 + 4x^{\frac{1}{2}} + \frac{8}{3}x^{-2}$

$\frac{dy}{dx} = 6x + 2x^{-\frac{1}{2}} - \frac{16}{3}x^{-3}$

$= 6x + \frac{2}{x^{\frac{1}{2}}} - \frac{16}{3x^3}$ (5)

c) $f(x) = 4x^3 + px^2 + 4x + p$

$f'(x) = 12x^2 + 2px + 4$ (4)

[14]

SECTION B

6a) $f(x) = x^3 - 8$

$0 = x^3 - 8$

$x^3 = 8$

$x = 2$

$\therefore P(2;0)$

$f'(x) = 3x^2$

$f'(2) = 3(2)^2$

$= 12$

$\therefore y = 12x + c$

$0 = 12(2) + c$

$-24 = c$

$\underline{y = 12x - 24}$ (5)

b) $f(x) = x^{-2}$

$f'(x) = -2x^{-3}$

$= \frac{-2}{x^3}$

$x > 0 \therefore x^3 > 0$

$\therefore f'(x) = \frac{-2}{\text{positive}}$

$= \underline{\text{negative}}$ (4)

[9]

7a) D(−1; 4) (2)

b) $h(x) = -x^2 + 4 - 4$

$h(x) = -x^2$ (2)

c) $x \geq 0$ or $x \leq 0$ (1)

d) $p = 1; q = 1$ (2)

e) At C and E, $x = 0$

E: $\therefore y = \frac{-2}{1} + 1$

$y = -1$

C: $y = -1^2 + 4$

$= 3$

$\therefore CE = 4$ units (3)

[10]

8a) $x = -2$ or 3 (2)

b) $-2 < x < 3$ (2)

c) -4 (1)

d) Adj S; $x = 1$

$\therefore$ By symmetry, $x = 1$. (2)

[7]

9a) $f'(x) = 3ax^2 + 2bx - 5$

$\therefore \underline{t = -5}$ (2)

b) $f(2) = 0$ (from graph)

$\therefore g(0) = \underline{-5}$ (2)

c) $m = \frac{30-0}{0-(-5)}$

$= \underline{10}$ (2)

1d) $f''(x)=0$ when

$x=\frac{-5-\frac{1}{3}}{2}$

$x=-\frac{8}{3}$

$\therefore f''(x)<0$ when

$x>-8/3$ (3)

e) $-5<x<-8/3$ (2)

[11]

10) $\hat{R}=90°$ ($\angle$ in semi ⊙)

$q=10-p$

area $=\frac{1}{2}pq$

$=\frac{1}{2}p(10-p)$

$A=5p-\frac{1}{2}p^2$

$\frac{dA}{dp}=5-p$

At max, $5-p=0$

$\therefore p=5$

$\therefore q=5$

$PQ^2=5^2+5^2$ (pythag)

$PQ=5\sqrt{2}$ [8]

11a) $s(28)$

$=-0,036(28)^2+2,02(28)+11,78$

$=40,1$ MPa (2)

b) $-0,036t^2+2,02t+11,78=24$

$-0,036t^2+2,02t-12,22=0$

$t=49,2$; $t=6,9$

$\therefore$ 7th day. (4)

c) $s'(t)=-0,072t+2,02$

$s'(21)=-0,072(21)+2,02$

$=0,5$ (3)

[7]

12a) 51; 49; 47...

$S_n=\frac{n}{2}\{2(51)+(n-1)(-2)\}$

$=\frac{n}{2}\{102-2n+2\}$

$=\frac{n}{2}\{104-2n\}$

$=52n-n^2$ (3)

b) B; 25; 24; 23...

$\therefore S_n=\frac{n}{2}\{2(25)+(n-1)(-1)\}$

$=\frac{n}{2}\{50-n+1\}$

$=\frac{n}{2}\{51-n\}$

$=\frac{51}{2}n-\frac{1}{2}n^2$

$52n-n^2+\frac{51}{2}n-\frac{1}{2}n^2=1500$

$104n-2n^2+51n-n^2=2000$

$0=3n^2-155n+2000$

$n\neq\frac{80}{3}$ or $n=25$ (5)

[8]

13)

$(24-23)(24+23)+(22-21)(22+21)$

$+(20-19)(20+19)\ldots+(2-1)(2+1)$

$=47+43+39\ldots 3$

$\therefore$ AS; $a=47$; $d=-4$; $n=12$

$S_{12}=6\{2(47)+11(-4)\}$

$=300$

[5]

14) $9.3^{2x}+m.3^{2x}=81-m^2$

$3^{2x}(9+m)=(9-m)(9+m)$

$3^{2x}=\frac{(9-m)(9+m)}{9+m}$

$3^{2x}=9-m$ (2)

b) RHS must be a power of 3

$\therefore m=8$ (2)

[4]