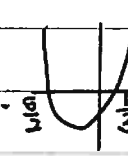


Grade 12 Prelim Exams

Mathematics Paper 1 memo

1a) i)  $-\sqrt{12-x} - 2x + 3 = 0$   
 $-2x + 3 = \sqrt{12-x}$  ✓  
 $4x^2 - 12x + 9 = 12 - x$  ✓  
 $4x^2 - 11x - 3 = 0$   
 $(4x+1)(x-3) = 0$  ✓  
 $x = -\frac{1}{4}$  ✓ or  $x = 3$  ✓ 5  
N/A ✓

ii)  $6x^2 + 13x - 4 \geq 1$   
 $6x^2 + 13x - 5 \geq 0$  ✓  
 $(3x-1)(2x+5) \geq 0$  ✓   
 $x < -\frac{5}{2}$  or  $x > \frac{1}{3}$  ✓ 4

iii)  $2^x = \frac{9^{\frac{1}{3}}}{3^{\frac{2}{3}} + \sqrt[3]{243}}$   
 $2^x = \frac{3^{\frac{2}{3}}}{3^{\frac{2}{3}} + 3^{\frac{3}{3}}}$  ✓  
 $2^x = \frac{3^{\frac{2}{3}}}{3^{\frac{2}{3}}(1+3)}$  ✓  
 $2^x = \frac{1}{4}$   
 $2^x = 2^{-2}$   
 $\therefore x = -2$  ✓ 3

b) i)  $2k = (x-5)(x-k)$   
 $2k = (2-5)(2-k)$  ✓  
 $2k = -3(2-k)$  ✓  
 $2k = -6 + 3k$   
 $6 = k$  ✓ 3

ii)  $2(2) = (x-5)(x-2)$  ✓  
 $4 = x^2 - 7x + 10$   
 $0 = x^2 - 7x + 6$  ✓  
 $0 = (x-6)(x-1)$  ✓ 4  
 $x = 6$  or  $x = 1$  ✓ 19

2)  $T_5 = 0$   
 $T_{13} = 16$

a)  $a + 4d = 0$   
 $a = -4d$  ✓ 1  
 $a + 12d = 16$  ✓ 2  
1 in 2  $-4d + 12d = 16$  ✓  
 $8d = 16$   
 $d = 2$  ✓

b)  $a = -4d$   
 $= -4(2)$  ✓  
 $= -8$  ✓ 6

3a)  $A = P(1+i)^n$   
 $2860 = 2000(1 + \frac{i}{12})^{18}$  ✓ ✓

$(\sqrt[18]{2860} - 1) \times 12 = i$

$0,24\dots = i$  ✓ 4  
 $24,08\% = r$  ✓

b)  $F_v = 1000 \left[ \frac{(1 + \frac{0,0725}{12})^{12 \times 1} - 1}{\frac{0,0725}{12}} \right]$  ✓ 5  
✓ formula  
 $= R12406,89$  ✓

Yes he will have enough money. 9

4a) i)  $A(-2; 0)$  2

ii)  $y = \frac{a}{x+1} - 2$  ✓

$(-2; 0)$   $0 = \frac{a}{(-2)+1} - 2$  ✓

$2 = \frac{a}{-1}$

$-2 = a$

$\therefore y = \frac{-2}{x+1} - 2$  ✓ 4

iii)  $y = ax^2 + bx + c$   
 $y = a(x+2)(x-0)$  ✓  
 $(-1, -2) \rightarrow -2 = a(-1+2)(-1-0)$  ✓  
 $-2 = -a$   
 $2 = a$  ✓  
 $\therefore f(x) = 2(x+2)(x)$   
 $f(x) = 2x^2 + 4x$  ✓ 4

b) i) on Answer sheet 2

ii)  $y > 1$   $y \in \mathbb{R}$  ✓ 1

iii) sketch on Answer sheet

$y = 2^x + 1$

$x = 2^y + 1$  ✓

$x - 1 = 2^y$  ✓

$y = \log_2(x-1)$  ✓

iv) on Answer sheet 1

v)  $x = 9$  ✓ 2 (21)

5 a)  $\lim_{x \rightarrow -4} \frac{5x^2 + 5x - 60}{x+4}$

$\lim_{x \rightarrow -4} \frac{5(x+4)(x-3)}{(x+4)}$

$= -35$  ✓ ✓ 4

b)  $y = \sqrt[3]{x} - \frac{2}{x}$

$= x^{\frac{1}{3}} - 2 \cdot x^{-1}$  ✓

$\frac{dy}{dx} = \frac{1}{3}x^{-\frac{2}{3}} + 2x^{-2}$  ✓ 4

c)  $f(x) = x^2 - 2$   $f(x+h) = (x+h)^2 - 2$

i)  $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$  ✓

$= \lim_{h \rightarrow 0} \frac{x^2 + 2xh + h^2 - 2 - x^2 + 2}{h}$  ✓

$= \lim_{h \rightarrow 0} \frac{h(2x+h)}{h}$  ✓ 1

$= 2x$  ✓ ✓ 5

ii)  $f'(x) = 2x$

$2x = 4$

$\therefore x = 2$  ✓

$\therefore y = (2)^2 - 2 = 2$

$m(2; 2)$  ✓ 2 (TS)

6 a) i)  $5 \times 3 \times 2 \times 3$  1

$= 90$  ✓

ii)  $8! = 40320$  ✓ 2

iii) ways of hanging:  $4! \cdot 6!$  ✓  
 $= 2880$  ✓

$P(\text{shirts all tog}) = \frac{2880}{40320}$  ✓

$= \frac{1}{14}$  ✓ or 9,0714 5

b)  $\frac{7!}{3! \cdot 2!}$  ✓ = 420 ✓ 3

(11)

7 a) i)  $T_n = \frac{4}{2^{n-1}}$

$\frac{4}{2^{n-1}} = \frac{1}{64}$  ✓

$2^{2-n+1} = 2^{-6}$

$3 - n = -6$

$9 = n$  ✓ 2

ii)  $T_1 = \frac{4}{2^{1-1}} = 4$

$\therefore r = \frac{1}{2}$

$T_2 = \frac{4}{2^{2-1}} = 2$

$S_{\infty} = \frac{a}{1-r}$

$= \frac{4}{1-\frac{1}{2}} = 8$  ✓ 3

b)  $f(x) = (x-2) \times g(x) + 6$

i)  $f(x) = 2x^2 + kx + 4$

$f(2) = 2(2)^2 + k(2) + 4$

$\therefore f(2) = 12 + 2k \sim \textcircled{1} \checkmark$

$f(2) = (2-2) \times g(2) + 6$

$\therefore f(2) = 6 \sim \textcircled{2} \checkmark$

$\textcircled{2} \text{ in } \textcircled{1}$

$6 = 12 + 2k \checkmark$

$-6 = 2k$

$-3 = k \checkmark \quad 4$

ii)  $g(x) = \frac{f(x) - 6}{(x-2)} \checkmark$

$g(x) = \frac{2x^2 - 3x - 2}{x-2}$

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

$\therefore g(x) = 2x+1 \checkmark \quad 3$

c)  $a = 2 \checkmark$

$b = 5 \checkmark$

$c = 1 \checkmark \checkmark$

$\textcircled{22}$

4

10a)  $y = x+1 \therefore m=1 \checkmark$

$f'(x) = 2ax + b = 1 \checkmark \sim \textcircled{1}$

$b = 1 - 2ax$

$b = 1 - 2a(-1)$

$b = 1 + 2a \sim \textcircled{2}$

$3 = a(-1)^2 + b(-1) \checkmark$

$3 = a - b$

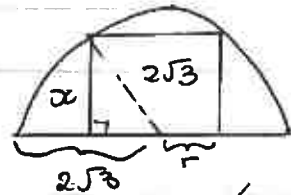
$\therefore b = a - 3 \sim \textcircled{3} \checkmark$

$\textcircled{2} \text{ in } \textcircled{3} \quad 1 + 2a = a - 3 \checkmark$

$a = -4 \checkmark$

$b = -7 \checkmark \quad 7$

b)



$r^2 + x^2 = (2\sqrt{3})^2 \checkmark$  Pythagoras  
 $\therefore r^2 = 12 - x^2$

$V = \pi r^2 h$

$= \pi (12 - x^2)x \checkmark$

$= 12\pi x - \pi x^3 \checkmark$

$\frac{dV}{dx} = 12\pi - 3\pi x^2 \checkmark$

For max volume  $\frac{dV}{dx} = 0 \checkmark$

$12\pi - 3\pi x^2 = 0$

$3\pi(4 - x^2) = 0$

$x = 2 \text{ or } x = -2 \checkmark$   
 N/A

$\therefore \text{max } V = 12\pi(2) - \pi(2)^3 \quad ||$

$= 24\pi - 8\pi$

$= 16\pi \text{ or } 50,27 \text{ cm}^3$

$\textcircled{18}$

b)  $z; x; y$        $z; x-1; y$   
 $x-2 = y-x \checkmark$        $x-1 = \frac{y}{2} \checkmark$   
 $2x = y+2$        $x-1 = \frac{y}{2}$

$2x-2 = y$  ①       $x^2 - 2x + 1 = 2y$  ②

① in ②

$x^2 - 2x + 1 = 2(2x-2) \checkmark$

$x^2 - 2x + 1 = 4x - 4$

$x^2 - 6x + 5 = 0$

$(x-5)(x-1) = 0$

$x = 5 \checkmark$  or  $x = 1 \checkmark$

$y = 2(5) - 2$  or  $y = 2(1) - 2$

$= 8 \checkmark$        $= 0 \checkmark$

$(5; 8)$  or  $(1; 0)$       8

c)  $\pi r^2 = 4\pi \checkmark$        $\pi r^2 = 9\pi$        $\pi r^2 = \frac{61}{4}\pi$

$r^2 = 4$

$r^2 = 9$

$r^2 = \frac{61}{4}$

$r = 2$

$\therefore r = 3$

$r = \frac{9}{2}$

$\therefore d = 4 \checkmark$        $d = 6 \checkmark$        $d = 9 \checkmark$

$\therefore \text{ratio} = \frac{6}{4} = \frac{3}{2} \checkmark$

$S_n = \frac{a(r^n - 1)}{r - 1}$

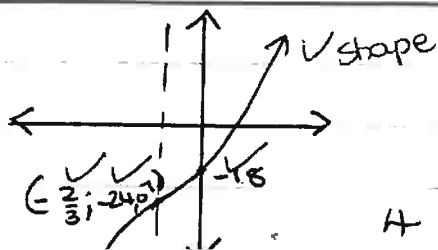
$\frac{665}{8} = \frac{4(\frac{3}{2}^n - 1)}{\frac{3}{2} - 1} \checkmark$

$\frac{729}{64} = \frac{3}{2}^n \checkmark$

$(\frac{3}{2})^6 = (\frac{3}{2})^n \checkmark$

$6 = n$

8  
21



4

8a)  $F_v = 130000(1 + \frac{16\%}{12})^3$   
 $= R133\ 929,25 \checkmark$

b) i)  $133\ 929,25 = x [1 - (1 + \frac{16\%}{12})^{-3}]$   
 $\frac{16\%}{12} \checkmark$

$x = R\ 3636,36 \checkmark$       3

ii)  $54 \times 3636,36 \checkmark$   
 $= R196\ 363,66 \checkmark$       2

8

9a) i)  $\frac{dy}{dx} = 3ax^2 + 2bx + c$

For stat points  $\frac{dy}{dx} = 0$

$\therefore x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \checkmark$

$= \frac{-2b \pm \sqrt{(2b)^2 - 4(3a)c}}{2(3a)} \checkmark$

$= \frac{-2b \pm \sqrt{4b^2 - 12ac}}{6a}$

$= \frac{-2b \pm \sqrt{4(b^2 - 3ac)}}{6a}$

$= \frac{-2b \pm 2\sqrt{b^2 - 3ac}}{6a}$

$x = \frac{-b \pm \sqrt{b^2 - 3ac}}{3a} \checkmark$       4

ii)  $x = \frac{-(2) \pm \sqrt{(2)^2 - 3(1)(10)}}{3(1)} \checkmark$

$= \frac{-2 \pm \sqrt{4 - 30}}{3} \checkmark$

$\therefore$  No real roots      3

iii)  $F(x) = x^3 + 2x^2 + 10x - 18$

$F'(x) = 3x^2 + 4x + 10$

$F''(x) = 6x + 4$        $F''(x) = 0$        $x = -\frac{2}{3}$

**ANSWER SHEET:**

**NAME:** \_\_\_\_\_

**Question 4bi and iii**

