GRADE 12 P1 TRIALS 2016

SECTION A

1 a) $(x-\sqrt{-3})(3^x-6)(2^x-8)=0$.

(1) $x\in Z$ $\quad 2^x=8$

$x=3$ (2)

(2) $x\in Q'$ $\quad 3^x=6$

$x=\log_3 6$

$=1,63$ (2)

(3) $x\in R'$ $\quad x=\sqrt{-3}$ (1)

b) i) $2x^2-7x-h=0$.

$$x=\frac{7\pm\sqrt{49-4(2)(-h)}}{4}$$

$$=\frac{7\pm\sqrt{49+8h}}{4}$$ (2)

ii) when $49+8h=0$

$8h=-49$

$h=-\frac{49}{8}$

$h=6,125$

$\approx 6,13$. (2)

[9]

2 $4p$; $3p+15$; $5p+20$.

(a) $\frac{3p+15}{4p}=\frac{5p+20}{3p+15}$

$(3p+15)^2=4p(5p+20)$

$9p^2+90p+225=20p^2+80p$.

$0=11p^2-10p-225$ (3)

(b) $p_1=5$ $\quad p_2=-\frac{45}{11}$

$\therefore p=5$ (1)

(c) $\frac{3p+15}{4p}=\frac{30}{20}=\frac{3}{2}=r$ (1)

(d) $S_{10}=\frac{20\left(\left(\frac{3}{2}\right)^{10}-1\right)}{\frac{1}{2}}$

$=40\left(\left(\frac{3}{2}\right)^{10}-1\right)$

$=2266,6$

≈ 2267. (3)

[8]

Q3

(a)(1) $S_2=\frac{2}{3}$ (1)

(2) $S_3=\frac{3}{4}$ (1)

(3) $S_4=\frac{4}{5}$ (1)

(4) $S_n=\frac{n}{n+1}$ (1)

(5) $\frac{2015}{2016}$ (1)

$r=2$.

(b) $T_{18}=10\cdot(2)^{17}$

$=R1310720$ (3)

c) $\sum_{r=0}^{\infty} \frac{a}{4^r} = 16$

$r=0 \quad T_1 = a$

$r=1 \quad T_2 = \frac{a}{4}$

$r=2 \quad T_3 = \frac{a}{16}$

$\therefore$ "a" $= a \qquad r = \frac{1}{4}.$

$$16 = \frac{a}{1-\frac{1}{4}}$$

$$16\left(\frac{3}{4}\right) = a$$

$$12 = a$$ (4)

12

Q4

width x

length $x+4$

(a) $P > 19,2$

$2(x+x+4) > 19,2.$

$2x+4 > 9,6$

$2x > 5,6$

$x > 2,8$ (2)

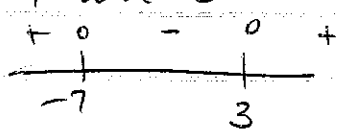
(b) $A < 21$

$x(x+4) < 21$

(c) $x^2+4x-21 < 0$

$(x+7)(x-3) < 0$

cv. -7 and 3



(4)

$\therefore -7 < x < 3$

(d) $2,8 < x < 3$ (1)

17

Q5 $f(x) = x^2 + \frac{16}{x}$

(a) $f'(x) = 2x - \frac{16}{x^2}$ (2)

(b) $2x - \frac{16}{x^2} = 0$

$2x^3 - 16 = 0$

$2x^3 = 16$

$x^3 = 8$

$x = 2.$

$\therefore y = 4+8 = 12$

$A(2;12)$ (4)

(c) Range of $f(x)$

$y \geq 12; \ y \in \mathbb{R}$

Domain of $f^{-1}(x)$

$x \geq 12; \ x \in \mathbb{R}$ (2)

(d)(1) $A'(4;12)$

(2) $A''(2;6)$ (2)

10

Q6 (a) $x\sqrt{27} + 21 = \frac{6x}{\sqrt{3}}$ x by $\sqrt{3}$

$x\sqrt{81} + 21\sqrt{3} = 6x.$

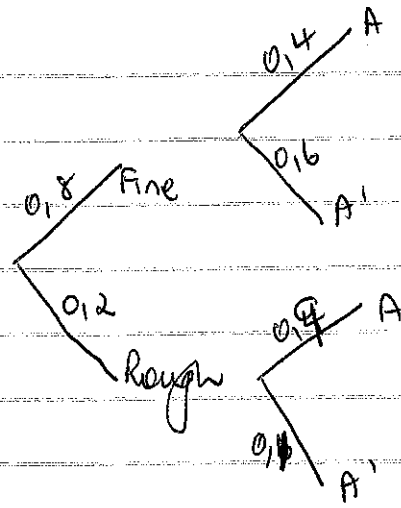
$9x - 6x = -21\sqrt{3}$

$3x = -21\sqrt{3}$

$x = -\sqrt{3}$ (4)

A cont....

Q 6 (b)



$P(A \text{ with}) = 0,8 \times 0,4 + 0,2 \times 0,9$

$= 0,32 + 0,18$

$= 0,5$ (5)

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SECTION B

Q7 $f(x) = 2x^3 - 5x^2 + ax + 18$

a) $f(3) = 0$

$2(3)^3 - 5(3)^2 + a(3) + 18 = 0$

$54 - 45 + 3a + 18 = 0$

$3a = -27$

$a = -9$ (2)

b) $f(x) = (x-3)(2x^2 + x - 6)$

$= (x-3)(2x-3)(x+2)$ (4)

c) $3^y = "x"$

$\therefore 3^y = 3 \;/\; 3^y = \frac{3}{2} \;/\; 3^y = -2$

$y = 1$ $\quad y = 0,37$ $\quad X$

(3)

19

Q8

(a) a?

2000 $T_{15} = a + 14d$

$238 = a + 14d.$

$238 - 14d = a$

2010 $T_{25} = a + 24d = 108$

$a = 108 - 24d$

$238 - 14d = 108 - 24d.$

$10d = -130$

$d = -13$

$\therefore a = 108 - 24(-13)$

1986 $a = 420$ houses. (5)

(b) $S_{25} = \frac{25}{2}[2(420) + 24(-13)]$

$= 6600$ houses. (2)

17

Q9

(a) (1) Rugby. 100 (1)

(2) $P(R \text{ or } C) = \frac{140}{200} = \frac{7}{10}$ (1)

(3) $P(\text{not}(R \text{ or } S \text{ or } C)) = \frac{20}{200} = \frac{1}{10}$ (1)

(4) $P(R \cap C) = \frac{25}{200} = \frac{1}{8}$

$P(R) \times P(C) = \frac{1}{2} \times \frac{65}{200} = \frac{65}{400} = \frac{13}{80}$

$\therefore$ not independent $\frac{1}{8} \neq \frac{13}{80}$. (4)

(b) $A = (8500-75)(1+0,01)^{\frac{1}{12}}(1,02)^{\frac{2}{12}}(1,03)^{\frac{3}{12}}(1,04)^{\frac{4}{12}}$

$= R8634,76$ → (4)

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Q10

New eq. R200 450

(a) Old eq.

New worth

$A = 167000(1-0,122)^{12}$

$= R35046,98$

Balance needed as loan

$200\,450 - 35\,046,98$

$= 165\,403,02.$

∴ loan will be @ 10,01% p.a. monthly

PV

$165\,403,02\left(1+\frac{0,1001}{12}\right)^{6} = x\left[\frac{1-\left(1+\frac{0,1001}{12}\right)^{-234}}{\frac{0,1001}{12}}\right]$

$173\,856,01$

$x = R1692,54$ per month → (5)

(b) $1692,54 \times 234 = 396\,053,83$

$- 165\,403,02$

INTEREST $230\,650,81$ → (3)

(c) $\frac{\text{interest}}{\text{loan}} = 1,39$ → (3)

Q11

(a) KARDASHIANS 11 letters

A x 3

"S" x 2

(a) $\frac{11!}{3!2!} = 3\,326\,400$ (5)

(b) $\frac{\frac{9!}{2!}}{3\,326\,400} = \frac{3}{55}$

9 letters

"S" x 2

(3)

8

* ALSO ACCEPT S.I. OPTION

$A = (8500-75)\left(1+0,01\times\frac{1}{12}\right)\left(1+0,02\times\frac{1}{6}\right)\left(1+0,03\times\frac{1}{4}\right)\left(1+0,04\times\frac{1}{3}\right)$

$= R8637,23$ →

ECTION C

Q12 $f(x) = x^2 - \frac{1}{3}x^3$

(a) $0 = x^2(1 - \frac{1}{3}x)$

$x = 0$ OR $x = 3$

$\therefore$ A(3;0) (1)

~~OR sub $x = 3$ and get $\Rightarrow$ $f(3) = 0$. NO!~~

(b) at A

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

$f'(3) = 6 - 9$

$= -3$

$y = -3x + c$

3;0) $0 = -9 + c$

$9 = c$

$y = -3x + 9$ (5)

(c) B? x?

$-3x + 9 = x^2 - \frac{1}{3}x^3$

$\frac{1}{3}x^3 - x^2 - 3x + 9 = 0$

$x_1 = -3 \quad x_2 = 3$

$\therefore$ Bx = -3 (4)

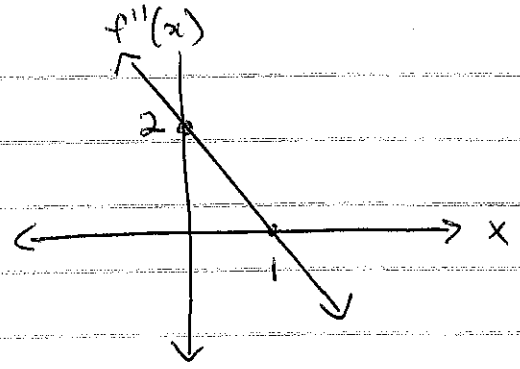
(d) $f''(x) = 2 - 2x = 0$ at A inflection

$2 = 2x$

$1 = x$ (2)

(e) $f''(0) = 2$. (2)

(f)



(3)

(g) f(x) has 3 Roots.

Between $x = 0$ and x of TP.

x TP. $2x - x^2 = 0$

$x(2 - x) = 0$

$x = 2$.

$\therefore y = 4 - \frac{8}{3}$

$= \frac{4}{3}$.

$\therefore \quad 0 > K > -\frac{4}{3}$ (5)

22

Q13

(E) c − a must be positive

pos − (neg)

2

Q14

$f(x) = 2^x - 8$

$g(x) = ax^2 + bx + c$

(a) A $x = ?$ $y = 0$

$0 = 2^x - 8$

$x = 3$ $\quad A(3;0)$

B $x = 0$ $\quad y = ?$

$2^0 - 8 = -7$ $\quad B(0;-7)$ (4)

(b) $y = -8$ (1)

(c) $h(x) = f(2x) + 8.$

$= 2^{2x} - 8 + 8$

$= 2^{2x}$

(d) $f^{-1}(x)$

$x = 2^y - 8$

$x + 8 = 2^y$

$\log_2(x+8) = y$ (2)

(e) $p(x) = -(2^x - 8)$

$= -2^x + 8$ (1)

(f) $f'(x) \cdot g(x) < 0$

everywhere except $x = 3$

$x \in \mathbb{R}$; $x \neq 3$ (2)

(g) $\sum_{n=0}^{3} g(n) - \sum_{n=4}^{5} g(n)$

$= -4,5 + 0 \quad = -4,5.$ (4)

OR find $g(x)$

$g(x) = ax^2 + bx - 4,5$

T.P. $g(x) = a(x-3)^2 + 0$

sub $(0; -4,5)$

$-4,5 = 9a$

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

$g(x) = -\frac{1}{2}(x^2 - 6x + 9)$

$= -\frac{1}{2}x^2 + 3x - 4,5.$

(2) $\sum_{n=0}^{3} g(n) - \sum_{n=4}^{5} g(n)$

$= -7 - (-\frac{5}{2})$

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

16

Q15

(a) $f(x) + f(x+3) = 2x + 5$

(1) $f(2) + f(5) = 9$

$f(5) + f(8) = 15.$

$f(2) + 2f(5) + f(8) = 24$

$12 + 2f(5) = 24$

$2f(5) = 12$

$f(5) = 6$ (4)

C cont....

Q15

b

$\frac{\Delta acres}{\Delta yr} = 2,718t^2 - 19,86t + 50,18$ million acres/yr.

$acres = \frac{2,718t^3}{3} - \frac{19,86t^2}{2} + 50,18t + 27,2$ million acres

In 2013 $t = 6$

$acres = \frac{2,718}{3}(6)^3 - \frac{19,86}{2}(6)^2 + 50,18(6) + 27,2.$

$= 166,496$ million acres in 2013. (5)

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