Grade 11 P1 November 2016

1 a) $\sqrt{x-2} = x-4$

$x-2 = (x-4)^2$ ✓

$x-2 = x^2-8x+16$ ✓

$0 = x^2-9x+18$

$0 = (x-6)(x-3)$ ✓

$x = 6$ or $x = 3$ ✓

invalid ✓ (5)

b) $x^2+x-6 \geq 0$

$(x+3)(x-2) \geq 0$ ✓

$x \in (-\infty;-3] \cup [2;\infty)$ ✓✓ (5)

c) $\dfrac{4^x-4^{x+1}}{3.4^{2x}} = -16$

$\dfrac{4^x-4^x.4^1}{3.4^{2x}} = -16$ ✓

$\dfrac{4^x(1-4)}{3.4^{2x}} = -16$ ✓

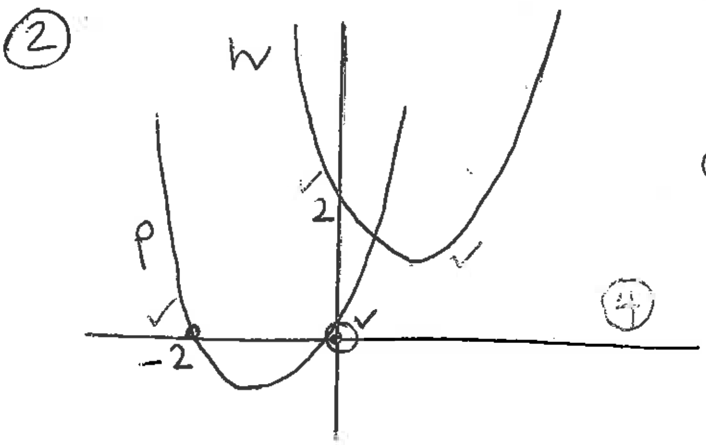
$\dfrac{4^{-x}(-3)}{3} = -16$ ✓

$4^{-x} = 16$ ✓

$4^{-x} = 4^2$

$x = -2$ ✓ (5)

2)



3 a) $y = a(x-\alpha)(x-\beta)$ where α, β are roots

$\therefore y = a(x+1)(x-3)$ —— (*) ✓

Subst $P(2;6)$

$6 = a(2+1)(2-3)$ ✓

$-2 = a$ ✓

Subst into (*)

$y = -2(x^2-2x-3)$

$= -2x^2+4x+6$ ✓ (4)

b) y-int $(0;6)$, x-int $(3;0)$ $\Big\}$ $m = \dfrac{6-0}{0-3} = -2$ ✓

$\therefore y = -2x+6$ ✓ (2)

c) $f(x) < 0$

$x \in (-\infty;-1) \cup (3;\infty)$ ✓ (2)

(ii) $f(x).g(x) \geq 0$

$x \in [-1;\infty)$ ✓✓ (2)

4 a) $f(x) = x^2+2x-4$

A.S: $x = -\dfrac{b}{2a} = \dfrac{-2}{2(1)} = -1$ ✓

$\therefore f(-1) = (-1)^2+2(-1)-4 = -5$ ✓

$\therefore B(-1;-5)$ ✓ (3)

b) $0 = -\dfrac{4}{x}-4$ ✓

$4 = -4/x$

$4x = -4$

$x = -1$ ✓ $\therefore A(-1;0)$ (2)

c) (i) $y \in [-5;\infty)$ ✓

(ii) $y \in (-\infty;-4) \cup (-4;\infty)$ ✓✓ (3)

d) $f(1)-g(1) = (1+2-4)-\left(\dfrac{-4}{1}-4\right)$

$= (-1)-(-8)$ ✓✓

$= 7$ units ✓ (3)

5 (a) (i)

$(x-3)(x+2)=0$

$x=3$ or $x=-2$ ✓ (1)

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

$x^2-x-6=3$ ✓

$x^2-x+4=9+4$

$(x-2)^2=$ ✓

$x-2=\pm\sqrt{1}$

$x=2\pm\sqrt{1}$ ✓ (2)

(b) $(a-1)^2+(2a+b)^2=0$

$(a-1)^2=0$ and $(2a+b)^2=0$ ✓

$\therefore a=1$ ✓ $\quad (2\times1+b)=0$

$b=-2$ ✓ (3)

(c) $x^2-4px=p^2$

$x^2-4px-p^2=0$ ✓

$\Delta=(-4p)^2-4(1)(-p^2)$ ✓

$=16p^2+4p^2$

$=20p^2$ ✓

$\therefore$ Roots are real & diff. ✓
irrational (4)

6 (a) $T_n=2n+1$

3; 5; 7; 9 ✓✓ (2)

(b) $\underbrace{8;\ x}_{3};\ \underbrace{x;\ y}_{5};\ \underbrace{y;\ 23}_{7};\ \underbrace{23;\ 32}_{9}$

1st diff: 3 5 7 9

$\therefore x-8=3$ ✓ $\quad 23-y=7$ ✓

$x=11$ ✓ $\quad y=16$ ✓ (4)

(c) 2nd diff $=2$ $\therefore a=1$ ✓

$\underbrace{7;\ 8}_{1};\ \underbrace{8;\ 11}_{3};\ \underbrace{11;\ 16}_{5};\ \underbrace{16;\ 23}_{7}$ ✓

$\therefore T_0=c=7$

$\therefore T_n=n^2+bn+7$

$8=1+b+7 \quad \therefore b=0$ ✓

$\therefore T_n=n^2+7$ ✓ (4)

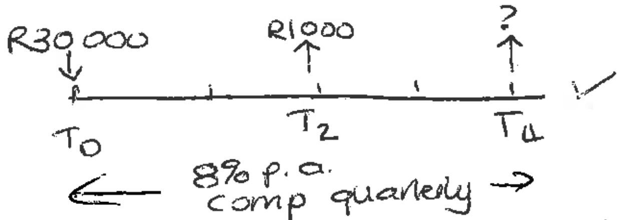
7 (a) $A=P(1+i)^n$

$2=1\left(1+\frac{x}{12}\right)^{8\times12}$ ✓

$\sqrt[96]{2}=1+\frac{x}{12}$

$\therefore x=8{,}7\%$ ✓ (4)

(b) (i)



$A=30\,000\left(1+\frac{0{,}08}{4}\right)^{16}-1000\left(1+\frac{0{,}08}{4}\right)^{8}$

$=R40\,011{,}91$ ✓ (4)

(ii) $1+i_{eff}=(1+i_{nom})^t$ ✓

$1+i_{eff}=\left(1+\frac{0{,}08}{4}\right)^4$ ✓

$\therefore i_{eff}=8{,}24\%$ ✓ (3)

8 (a) $P(\text{same})=\frac{4}{16}\cdot\frac{3}{15}+\frac{12}{16}\cdot\frac{11}{15}$

$=\frac{3}{5}$ ✓ (4)

(b) $P(A)=0{,}4 \quad P(B)=0{,}5$

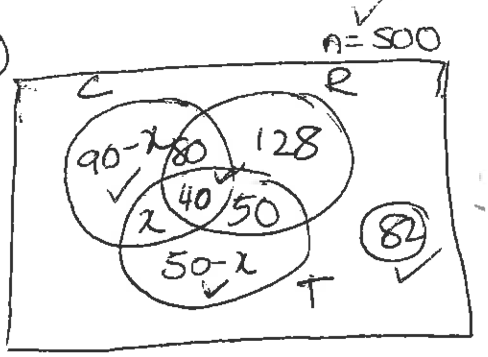
$P(A).P(B)=0{,}2=P(A\text{ and }B)$ ✓

$P(A\text{ or }B)=P(A)+P(B)-P(A\text{ and }B)$

$=0{,}4+0{,}5-0{,}2$ ✓

$=0{,}7$ ✓ (3)

⑨



$210+128+50+50-x+82=500$

$520-x=500$

$x=20$

P(C and T and not rugby)

$=\frac{x}{500}=\frac{20}{500}=\frac{1}{25}$

⑦

⑩ $p(x)=b^{x+c}+d$

$\therefore p(x)=b^{x+c}-4$

Subst $(0;-2)$

$-2=b^{0+c}-4$

$2=b^{c}$ ——— ①

Subst $(2;0)$

$0=b^{2+c}-4$

$0=b^{2}\cdot b^{c}-4$

$0=b^{2}(2)-4$ from ①

$4=2b^{2}$

$2=b^{2}$

$\sqrt{2}=b$

⑥

$\therefore 2=\sqrt{2}^{\,c}$

$(\sqrt{2})^{2}=\sqrt{2}^{\,c}$

$\therefore c=2$

⑪ ⓐ $f(x)=\frac{k}{x+k}+k$

$f(0)=\frac{k}{k}+k=1+k$

$0=\frac{k}{x+k}+k$

$0=k+k(x+k)$

$0=k+kx+k^{2}$

$0=k(1+x+k)$

$\therefore k=0$ or $1+x+k=0$

$x=-1-k$

$\therefore$ Roots are equal but opp in sign

4

ⓑ

Asymptotes meet at $(-k;k)$

Eqn of A.S. is $y=-x+c$

Subst $(-k;k)$: $k=-(-k)+c$

$0=c$

$\therefore y=-x$

③

⑫

Consider (by trial & error) 45

20% of 45 = 9

$\therefore$ other number is $45+9=54$

③