Grade 10 Nov P1 /100 04.11.22

1.1. $q = \sqrt{b^2 - 4ac}$

1.1.1 $q = \sqrt{(-1)^2 - 4(2)(-4)}$ ✓sub

$= \sqrt{33}$ ✓ans

ao 1/2 2

1.1.2 Irrational ✓ 1

1.1.3. $\sqrt{25}$ $\sqrt{33}$ $\sqrt{36}$ ✓25, 36

5 $\sqrt{33}$ 6

$\therefore$ 5 and 6 ✓

ao 0/2 2

1.2. $(3p + q)^2$

$= 9p^2 + 6pq + q^2$ ✓exp

$= 9p^2 + q^2 + 6pq$

$= 12 + 6(-3)$ ✓sub

$= -6$ ✓ans 3

1.3. $10x = 7,777\ldots$ ✓

$x = 0,777\ldots$

$9x = 7$ ✓

$x = \frac{7}{9}$ ✓

ao 1/3 3

1.4.1 $4x - x^3$

$= x(4 - x^2)$ ✓cf

$= x(2 - x)(2 + x)$ ✓dos

2

1.4.2 $\frac{x^3 + 1}{x^2 - x + 1}$

$= \frac{(x+1)(x^2 - x + 1)}{x^2 - x + 1}$ ✓num

$= x + 1$ ✓

2

1.5. $\frac{2^x}{2^x - 3.2^{x-1}}$

$= \frac{2^x}{2^x - 3.2^x.2^{-1}}$

$= \frac{2^x}{2^x(1 - 3.2^{-1})}$ ✓cf

$= \frac{1}{1 - 3/2}$

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

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

$= -2$ ✓ans

2

2.1.1 $x(x-10) = x-10$

$x^2 - 10x = x - 10$ ✓ std f

$x^2 - 11x + 10 = 0$ ✓ fact

$(x-1)(x-10) = 0$

$\therefore x = 1$ or 10 ✓ ans → 3

2.1.2. $3x^3 - 15x^2 - 8x + 40 = 0$

$3x^2(x-5) - 8(x-5) = 0$

$(x-5)(3x^2 - 8)$ ✓ fact $= 0$

$x = 5$ or $3x^2 - 8 = 0$

✓ ans

$x^2 = 8/3$

$x = \pm\sqrt{8/3}$

$= \pm 1{,}63$

✓ NB ± → 3

2.1.3. $2x^{-3/5} + 7 = 0$

$x^{-3/5} = -\frac{7}{2}$ ✓ isolate

$(x^{-3/5})^{-5/3} = (-\frac{7}{2})^{-5/3}$ ✓ method

$x = -0{,}12$ ✓ ans → 3

$-3/5$ ✓ lose method mark

max 2/3

2.1.4. $x(x^{\frac{1}{4}} + 2) = 0$

$x = 0$ or $x^{\frac{1}{4}} = -2$

✓ ans

$(x^{\frac{1}{4}})^4 = (-2)^4$

$x = 16$

reject

does NOT need to be shown

n.s. ✓ ∴ no soln → 2

2.2.1. $\frac{x}{5} - 1 \leq 2 - \frac{x}{10}$

$\times 10$: $2x - 10 \leq 20 - x$ ✓

$3x \leq 30$

$x \leq 10$ ✓ → 2

OR

$\frac{1}{5}x - 1 \leq 2 - \frac{1}{10}x$

$\frac{3}{10}x \leq 3$ ✓

$x \leq 10$ ✓

2.2.2. $x \in (-\infty; 10]$ ✓ → 1

2.3. $3x - y - 5 = 0$

$5x + 3y = 13$

$3x - 5 = y$ ✓

$5x + 3(3x-5) = 13$ ✓

$5x + 9x - 15 = 13$

$14x = 28$

$x = 2$ ✓

$\therefore y = 3(2) - 5$

$= 1$ ✓ → 4

OR

$3x - y = 5$

$\times 3$: $9x - 3y = 15$ ✓

$5x + 3y = 13$

(2)

NB ( )

3.1. $7-(x-3)=3x-1-(7)$ ✓

$7-x+3=3x-1-7$

$18=4x$

$\frac{9}{2}=x$ ✓

2

3.2. $-97;\ -94,5;\ -92;\ \ldots;\ 208$

3.2.1. $a=-97$

$d=2,5$ 5/2

$T_n=a+(n-1)d$

$=-97+(n-1)(2,5)$

$=-97+(2,5n-2,5)$

$=-97+2,5n-2,5$

$=-99,5+2,5n$ 2

$\frac{-199}{2}$ ✓T_1 5/2 ✓T_2

3.2.2. $T_n=208$

$-99,5+2,5n=208$ ✓

$2,5n=307,5$ $\frac{615}{2}$

$n=123$ ✓

2

3.2.3. (a) $T_n>0$

$-99,5+2,5n>0$ ✓

$2,5n>99,5$

$n>39,8$ ✓ $\frac{199}{5}$

$\therefore n=40$ ✓ 3

(3) . manually.. : terms must be shown

$14x=28$ ✓

$x=2$ ✓

$3(2)-y=5$

$1=y$ ✓

(OR)

$3x-y=5$ $\times -5$: ✓ $-15x+5y=-25$

$5x+3y=13$ $\times 3$: ✓ $15x+9y=39$

$14y=14$

✓ $y=1$

$3x-(1)=5$

$3x=6$

$x=2$ ✓

3.2.3. (b) $T_{40} = -99,5 + 2,5(40)$

$= 0,5$ ✓ $\frac{1}{2}$ ▷ 1

4.1. $A = P(1+i)^n$ ✓i

$3x = x\left(1 + \frac{4,3}{1200}\right)^n$ ✓f+s

$\div x \quad (x \neq 0)$

✓LHS 3 $\quad 3 = \left(\frac{12043}{12000}\right)^n$

✓logs $\quad n = \frac{\log(3)}{\log\left(\frac{12043}{12000}\right)}$

✓ans $\quad = 307,14$ months ▷ 5

(308 full months)

4.2. $£1000 \times \frac{R\,19}{1\,£} \times \frac{1\ US\$}{R\,15}$

$=$ US $ 1 266,67 ✓✓ ▷ 2

(OR)

$£1000 = R\,19\,000$ ✓

$R\,19\,000 = \frac{19000}{15}$ ✓

$=$ US $ 1266,67 ▷

4.3.1. Simple ✓ ▷ 1

4.3.2 $m = iP$

$= \frac{3}{100} \cdot 20\,000$

$= 600 \quad \frac{R}{yr}$ ▷ 1

✓value

(4)

5.1 $f: \quad y = 6 \cdot 3^x - 2$

5.1.1 ha: $y = -2$ ✓ 1

ha: -2 0/1 must have $y =$

5.1.2 (a) yint: $y = 6 \cdot 3^0 - 2$

$= 4$ ✓ 1

(b) xint: $0 = 6 \cdot 3^x - 2$

$3^x = \frac{1}{3}$

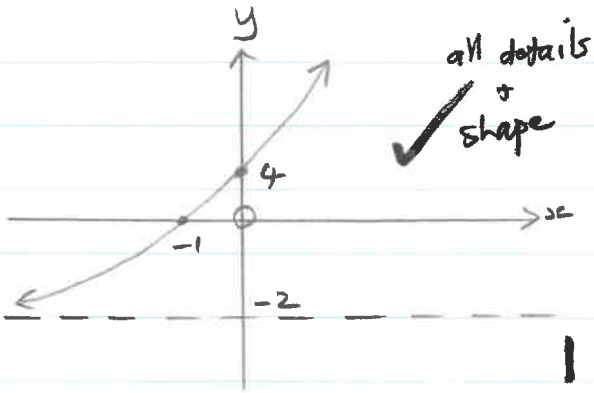
$= 3^{-1}$ or logs

method ✓

✓ $\therefore x = -1$

ao 2/2 2

5.1.3.



all details + shape ✓

1

5.1.4. $y \in (-2; \infty)$ ✓A NO CA 1

OR

$y > -2$

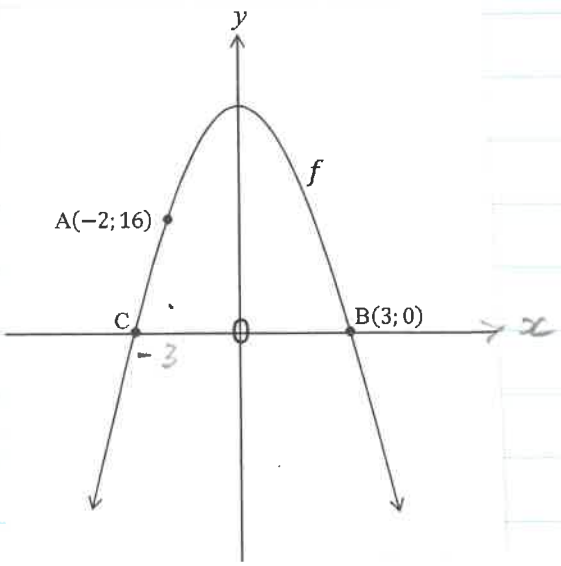
5.1.5. $f: \quad y = 6 \cdot 3^x - 2$

g: ✓ $-y = 6 \cdot 3^x - 2$

✓ $y = -6 \cdot 3^x + 2$ 2

• ao 2/2

5.2. $f: \quad y = ax^2 + c$



5.2.1. AOS : $x = 0$ ✓ 1

• y axis 0/1

5.2.2. $x_c = -3$ ✓ 1

5.2.3. $y = a(x+3)(x-3)$ ✓ NB a

Sub $A(-2;16)$

$16 = a(-2+3)(-2-3)$ ✓ sub

$16 = a(-5)$

$a = -\frac{16}{5}$ ✓ a $\quad -3,2$

$\therefore y = -\frac{16}{5}(x+3)(x-3)$

$= -\frac{16}{5}(x^2 - 9)$

$= -\frac{16}{5} + \frac{144}{5}$

$c = \frac{144}{5}$ ✓ c $\quad 28,8$ 4

5.2.4. Decr $x \in (0; \infty)$ ✓ 1

OR

$x > 0$

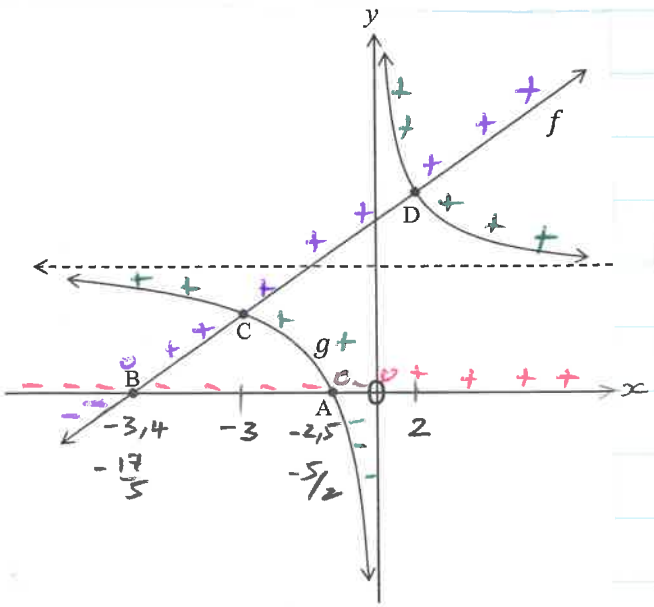
5.2.5. $f_{max} = y_{max}$

$= \frac{144}{5}$ ✓ $\quad 28,8$ 1

• cn from c in 5.2.3.

(6)

6. $f: y = \frac{5}{6}x + \frac{17}{6}$ $g: y = \frac{5}{x} + 2$



6.1.1. R_f : $y \in \mathbb{R}$ ✓ 1

OR

$y \in (-\infty; \infty)$

6.1.2. D_g : $x \in \mathbb{R}; x \neq 0$ ✓ 1

OR

$x \in (-\infty; 0)$ or $(0; \infty)$

6.2.1. x-int: $0 = \frac{5}{6}x + \frac{17}{6}$

$-\frac{17}{6} = \frac{5}{6}x$

$-\frac{17}{5} = x$ ✓ $-3,4$ 1

6.2.2. x-int: $0 = \frac{5}{x} + 2$

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

LCD $= x$ $(x \neq 0)$

x thru

$-2x = 5$

$x = -5/2$ ✓ $-2,5$ 1

6.3. $y = -x$

$\therefore y = -x + 2$ ✓ 1

6.4. $y = \frac{5}{6}x + \frac{17}{6}$ $y = \frac{5}{x} + 2$

equate ✓

$\frac{5}{6}x + \frac{17}{6} = \frac{5}{x} + 2$

LCD $= 6x$ $(x \neq 0)$

$\frac{5}{6}x \cdot 6x + \frac{17}{6} \cdot 6x = \frac{5}{x} \cdot 6x + 2 \cdot 6x$

$5x^2 + 17x = 30 + 12x$ ✓ xLCD

$5x^2 + 5x - 30 = 0$

$\div 5$: $x^2 + x - 6 = 0$ ✓ sf

$(x - 2)(x + 3) = 0$ ✓ fact

$\therefore x = 2$ or -3

$\therefore x_C = -3$

$x_D = 2$ 4

6.5.1. $f(x) \geq g(x)$

$y_f \geq y_g$

✓A ✓A

$x \in [-3; 0)$ or $[2; \infty)$ 2

OR

$-3 \leq x < 0$ or $x \geq 2$

6.5.2. $f(x) \cdot g(x) \geq 0$

$y_f \cdot y_g$ 0 +

✓A ✓A

$x \in [-\frac{17}{5}; -\frac{5}{2}]$ or $(0; \infty)$ 2

$-3,4$ $-2,5$

OR

$-\frac{17}{5} \leq x \leq -\frac{5}{2}$ or $x > 2$

6.5.3. $x \cdot f(x) < 0$

$x \cdot y_f$ $-$

✓A 1

$x \in (-\frac{17}{5}; 0)$

$-3,4$

OR

$-\frac{17}{5} < x < 0$

- and ; penalty -1 mark penalise once only
- $x > 2$ is the same as $2 < x$
- A = accuracy using values from 6.2. and 6.4.

7.1. $P(A) = \frac{2}{5}$ $P(B') = \frac{3}{8}$

$P(A \cup B) = \frac{5}{7}$

7.11 (a) $P(B) + P(B') = 1$

$P(B) + \frac{3}{8} = 1$

$P(B) = \frac{5}{8}$ ✓ 0,63

1

(b) $P(A \cup B) = P(A) + P(B) - P(A \cap B)$ ✓f

$\frac{5}{7} = \frac{2}{5} + \frac{5}{8} - P(A \cap B)$ ✓sub

$P(A \cap B) = \frac{87}{280}$ ✓ 3 0,31

. formula can be implied by sub

7.1.2 $P(A \cap B) = \frac{87}{280}$

$\neq 0$ ✓

∴ A and B are NOT mutually exclusive. ✓

2

7.2. $P(A) = 0,3$ $P(B) = 0,65$

$P(A \cup B) = 0,74$

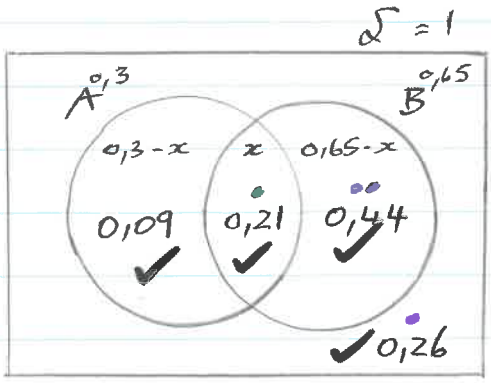
$0,74 = 0,3 + 0,65 - P(A \cap B)$

$P(A \cap B) = 0,21$

$0,3 - x + x + 0,65 - x = 0,74$

$0,21 = x$

7.2.1.



✓ ✓ ✓ ✓

4

7.2.2. (a) $P(A \text{ only}) = 0,09$ ✓

1

(b) $P(A' \cap B)$ both

$= 0,44$ ✓

1

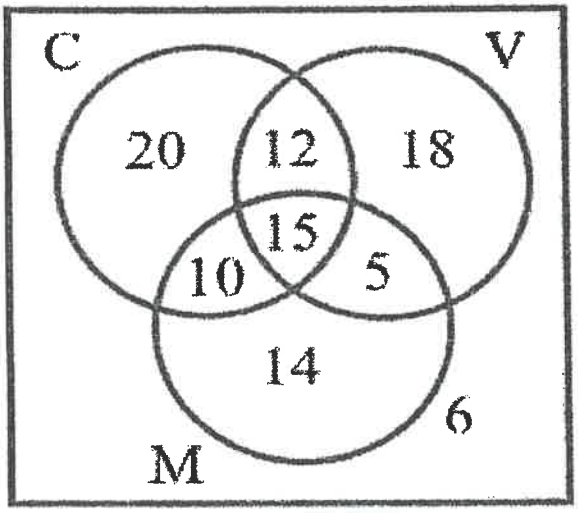
(c) $P(A' \cup B)$ any

$= 0,21 + 0,44 + 0,26$

$= 0,91$ ✓

1

7.3. $\mathcal{U} = 100$



7.3.1. $n(\text{all 3 types}) = 15$ ✓ → 1

7.3.2. $n(\text{at least one flavour})$
$= 100 - 6$
$= 94$ ✓ → 1

7.3.3. $n(V \cap M \text{ but } C')$
$= 5$ ✓ → 1