: 11

DATE : 28 / 10 / 20 16

SUBJECT : Mathematics

TITLE : NOV P 1

SOLUTIONS

EXAMINER : ~~Mr A. Slaughter~~ DOE

TOTAL MARKS : 150

TIME : 3 hour(s)

1.1. 1. $(x+2)^2 = 1$

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

$x+2 = \pm 1$

$\therefore x+2 = 1$ or $x+2 = -1$

$x = -1$ $\qquad$ $x = -3$

(OR)

$(x+2)^2 = 1$

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

$x^2 + 4x + 3 = 0$

$(x+3)(x+1) = 0$

$\therefore x = -3$ or -1

1.1. 2. $2x^2 - 11x - 4 = 0$

$(\quad x \quad) = 0$

$x = \dfrac{-(-11) \pm \sqrt{(-11)^2 - 4(2)(-4)}}{2(2)}$

$= \dfrac{11 \pm \sqrt{153}}{4}$

$= 5{,}84$ or $-0{,}34$

1.1. 3. $x^2 > \frac{1}{4}$ and $x < 0$

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

$(x - \frac{1}{2})(x + \frac{1}{2}) > 0$

(+) 0 $-\frac{1}{2}$ $-$ 0 $\frac{1}{2}$ (+)

$x < -\frac{1}{2}$ or $\frac{1}{2} < x$

So, $\leftarrow$ $-\frac{1}{2}$ or $\frac{1}{2}$ $\rightarrow$

and

$\leftarrow$ 0

$\therefore$ $\leftarrow$ 0 $-\frac{1}{2}$

$\therefore x < -\frac{1}{2}$

1.1. 4. $x+5 = \sqrt{3-3x}$

$(x+5)^2 = 3-3x$

$x^2+10x+25 = 3-3x$

$x^2+13x+22 = 0$

$(x+2)(x+11) = 0$

$\therefore x = -2$ or -11 reject

1.2. 1. y^2-9x^2

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

1.2. 2. $y+3x=2 \quad y^2-9x^2 = 16$

$y = 2-3x$

$(2-3x)^2 - 9x^2 = 16$

$4-12x+9x^2-9x^2 = 16$

$-12 = 12x$

$-1 = x$

$\therefore y = 2-3(-1)$

$= 5$

2.1. 1. $\left(\frac{a^3}{2}\right)^2$

$= \frac{a^6}{4}$

2.1. 2. $\frac{2^{x-3} - 3.2^{x-1}}{2^{x-2}}$

$= \frac{2^x.2^{-3} - 3.2^x.2^{-1}}{2^x.2^{-2}}$

$= \frac{2^x(2^{-3} - 3.2^{-1})}{2^x.2^{-2}}$ *

$= -\frac{11}{2}$

Had the question said WOC :

* $\frac{\frac{1}{2^3} - 3.\frac{1}{2}}{\frac{1}{2^2}}$

$= \frac{\frac{1}{8} - \frac{3}{2}}{\frac{1}{4}}$

$= \frac{1-12}{8} \times \frac{4}{1}$

$= \frac{-11}{2}$

22. 10^{x+3} $10^x = 1,5$

$= 10^x \cdot 10^3$

$= 1,5 \cdot 1000$

$= 1\,500$ ⟶

23. 1. $2^x = 0,125$

$x = \frac{\log 0,125}{\log 2}$

$= -3$ ⟶

Had the question said

WOC :

$2^x = 0,125$

$= \frac{125}{1000}$

$= \frac{1}{8}$

$= \frac{1}{2^3}$

$= 2^{-3}$

$\therefore x = -3$

23. 2. $0,5^x \sqrt{1 + \frac{9}{16}} = 10$

$0,5^x \cdot \frac{5}{4} = 10$

$0,5^x = 8$

$x = \frac{\log 8}{\log 0,5}$

$= -3$ ⟶

Had the question said

WOC :

$0,5^x \sqrt{1 + \frac{9}{16}} = 10$

$(\frac{1}{2})^x \sqrt{\frac{16+9}{16}} = 10$

$(\frac{1}{2})^x \sqrt{\frac{25}{16}} = 10$

$(\frac{1}{2})^x \cdot \frac{5}{4} = 10$

$(\frac{1}{2})^x = \frac{10}{5/4}$

$(\frac{1}{2})^x = 10 \times \frac{4}{5}$

$(\frac{1}{2})^x = 8$

$(2^{-1})^x = 2^3$

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

$\therefore -x = 3$

$x = -3$

31. $2x(x+1) + m = x$

$2x^2 + 2x + m = x$

$2x^2 + x + m = 0$

$\Delta = (1)^2 - 4(2)(m)$

$= 1 - 8m$

Non real roots :

$\Delta < 0$

$1 - 8m < 0$

$-8m < -1$

$m > \frac{1}{8}$ →

3.2. $f(x) = \frac{\sqrt{x+2}}{5-x^2}$

Not defined

$\therefore$ undefined

$\therefore$ den = 0

$5 - x^2 = 0$

$5 = x^2$

$\pm\sqrt{5} = x$

$\pm 2{,}24 = x$

[non-real:

$x + 2 < 0$

$x < -2$]

4.1. 7; 12; 17; ...

(5; 5)

4.1.1. 22; 27 →

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

$= 7 + (n-1)(5)$

$= 7 + (5n - 5)$

$= 7 + 5n - 5$

$= 5n + 2$ →

4.1.3. $T_n = 12^5$

$5n + 2 = 12^5$

$n = 49\,766$

$n \in \mathbb{N}$ $\therefore$ yes, 12^5 is a term in the sequence.

4.1.4. 7; 12; 17; 22; 27; 32; 37;

n: 1 (2) 3 (4) 5 (6) 7

In the sequence, when the position of the term is

even

ie $N = 2n$

then you get

$T_N = 5(2n) + 2$

$= 10n + 2$

- $10n$ ends with 0
- $10n+2$ ends with 2

$\therefore T_N$ ends with 2

Hence, the terms ending in 2 will be part of the original sequence.

1.2. 3; 9; 17; 27; ...

6 8 10

2 2

4.2. 1. 39 ⟶

4.2. 2. $d_2 = 2a$ $d_1 = 3a+b$ $T_1 = a+b+c$

$2 = 2a$ $6 = 3(1)+b$ $3 = 1+3+c$

$1 = a$ $3 = b$ $-1 = c$

$\therefore T_n = n^2 + 3n - 1$ ⟶

4.2. 3. $T_n > 269$

$n^2 + 3n - 1 > 269$

$n^2 + 3n - 270 > 0$

$(n-15)(n+18) > 0$

+ 0 − 0 +

−18 15

$n < -18$ or $15 < n$

$\therefore n = 16$

$\therefore T_{16} = (16)^2 + 3(16) - 1$

$= 303$ ⟶

4.3. 1. $x ; 6 ; 2 ; y ; -18$

$6-x \quad -4 \quad y-2 \quad -18-y$

A B C

$A = -4-(6-x)$

$= -4-6+x$

$= x-10$

$B = y-2-(-4)$

$= y-2+4$

$= y+2$

$C = -18-y-(y-2)$

$= -18-y-y+2$

$= -2y-16$

Quad seq, so:

$x-10 = y+2 \quad y+2 = -2y-16$

$3y = -18$

$y = -6$

$\therefore d_2 = B$ or C

$= y+2$

$= -6+2$

$= -4$

4.3. 2. $x-10 = y+2$

$= -6+2$

$x = 6 = T_1$

5. $f(x) = \frac{8}{x-8} + 4$

5.1 ha: $y = 4$

va: $x-8 = 0$

$\therefore x = 8$

5.2. Df: $x \in \mathbb{R}; x \neq 8$

Rf: $y \in \mathbb{R}; y \neq 4$

5.3. $y = \frac{8}{x-8} + 4$

- hyperbola
- yint: $y = \frac{8}{0-8} + 4$

$= 3$

- xint: $0 = \frac{8}{x-8} + 4$

$-4 = \frac{8}{x-8}$

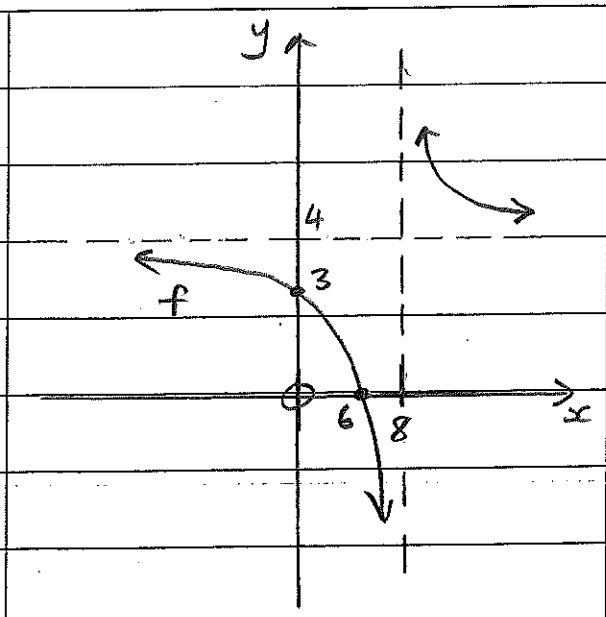
LCD $= (x-8) \quad (\therefore x \neq 8)$

x thru

$-4(x-8) = 8$

$x = 6$

- ha: $y = 4$
- va: $x = 8$
- shape k+: ⌐¬



5.4. 1. $\frac{8}{x-8} \geq -4$

$\frac{8}{x-8} + 4 \geq 0$

$f(x) \geq 0$

$y_f \geq 0$

$\therefore x \in (-\infty; 6]$ or $(8; \infty)$

5.4. 2. $f(x) \leq 3$

$y_f \leq 3$

$\therefore x \in [0; 8)$

5.5. positive grad ??

$y = x - 8 + 4$

$= x - 4$

5.6. $f(x) = \frac{8}{x-8} + 4$

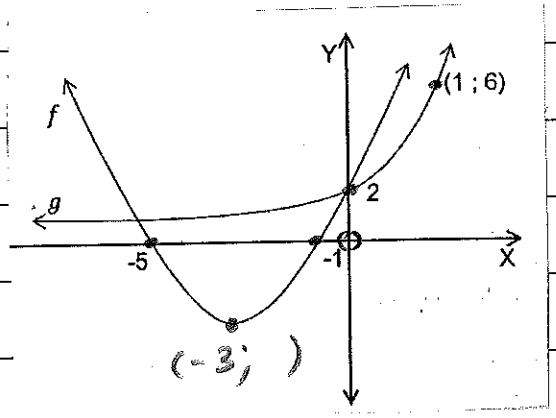
$g(x) = f(x-2) - 2$

$= \frac{8}{(x-2)-8} + 4 - 2$

$= \frac{8}{x-2-8} + 4 - 2$

$= \frac{8}{x-10} + 2$

6.



$f: y = ax^2 + bx + c$ $g: y = k \cdot m^x$

6.1. $y = a(x+5)(x+1)$

sub $(0;2)$

$2 = a(0+5)(0+1)$

$= 5a$

$\frac{2}{5} = a$

$\therefore y = \frac{2}{5}(x+5)(x+1)$

$= \frac{2}{5}(x^2 + 6x + 5)$

$= \frac{2}{5}x^2 + \frac{12}{5}x + 2$

6.2. $y = k \cdot m^x$

Sub $(0;2)$

$2 = k \cdot m^0$

$2 = k \cdot 1$

$2 = k$

$y = 2\,m^x$

sub $(1;6)$

$6 = 2 \cdot m^1$

$3 = m$

$\therefore y = 2 \cdot 3^x$

6.3. ha: $y = 0$

6.4. 1. $f(x)$ decreasing

f down L → R

$x_{tp} = \frac{-5+(-1)}{2}$

$= -3$

$\therefore x \in (-\infty; -3)$

6.4. 2. $2 \leq g(x) \leq 6$

$2 \leq y_g \leq 6$

$\therefore x \in [0; 1]$

6.4. 3. $g(x) \leq 2$

$y_g \leq 2$

$x \in (-\infty; 0]$

6.4. 4. $f(x) \cdot g(x) < 0$

$y_f \cdot y_g$ −

$\therefore x \in (-5; -1)$ →

6.5. $(-5;0)$ $(0;2)$

av grad

$= \frac{\Delta y}{\Delta x}$

$= \frac{2-0}{0-(-5)}$

$= \frac{2}{5}$ →

7. $y = b^x$

7.1. 2 →

$\therefore x \to x-2$

4 ↑

$\therefore y \to y+4$

$\therefore y = b^{x-2} + 4$

Sub $(4;8)$

$8 = b^{4-2} + 4$

$4 = b^2$

$\pm\sqrt{4} = b$

$\pm 2 =$

$\therefore b = 2$ (reject -) →

7.2. $y = 2^{x-2} + 4$ →

8.1. $A = P(1-i)^n$

$= 7200\left(1 - \frac{25}{100}\right)^3$

$= R\ 3\,037,50$

8.2. $A = P(1+i)^n$

$1\,126,10 = 500\left(1 + \frac{x}{200}\right)^{12}$

$2,2522 = \left(1 + \frac{x}{200}\right)^{12}$

$\sqrt[12]{2,2522} = 1 + \frac{x}{200}$

$1,07\ldots = 1 + \frac{x}{200}$

$14,00\,\% = x$

8.3. 1. $1 + i_{ea} = \left(1 + \frac{i_{nom}}{k}\right)^k$

$1 + i_{ea} = \left(1 + \frac{7,2}{1200}\right)^{12}$

$i_{ea} = 0,07\ldots$

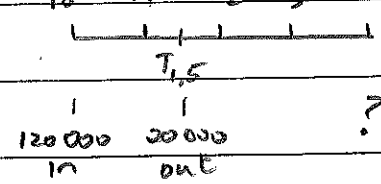
$I_{ea} = 7,442\,\%\ pa$

8.3. 2. $A = P(1+i)^n$

$= 120\,000\left(1 + \frac{7,442}{100}\right)^3$

$= R\ 148\,834,46$

8.3. 3.



7,442 % pa

7,2 % pa mon.

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

- Parallel method

$A = 120\,000\left(1 + \frac{7,442}{100}\right)^4$

$= 159\,910,72\ldots$

$A = 20\,000\left(1 + \frac{7,442}{100}\right)^{2,5}$

$= 23\,931,24\ldots$

So:

$159\,910,72\ldots - 23\,931,24\ldots$

$= R\ 135\,979,48$

(OR)

$A = 120\,000\left(1 + \frac{7,2}{1200}\right)^{48}$

$= 159\,913,20\ldots$

$A = 20\,000\left(1 + \frac{7,2}{1200}\right)^{30}$

$= 23\,931,47\ldots$

So,

$159\,913,20\ldots - 23931,47\ldots$

$= R\ 135\ 981,73$

• Snowball method

$A = 120\,000\left(1 + \frac{7,442}{100}\right)^{1,5}$

$= 133\,641,81\ldots$

$A = 113641,81\ldots\left(1 + \frac{7,442}{100}\right)^{2,5}$

$= R\ 135\ 979,48$

(OR)

$A = 120\,000\left(1 + \frac{7,2}{1200}\right)^{18}$

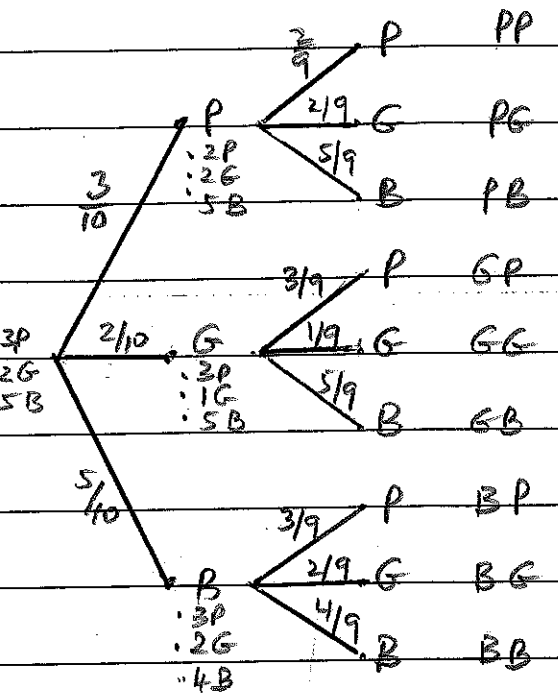
$= 133\,642,59\ldots$

$A = 113642,59\ldots\left(1 + \frac{7,2}{1200}\right)^{30}$

$= R\ 135\ 981,73$

9. 3P 2G 5B

9.1.



9.2 1. $P(BB) = \frac{5}{10} \times \frac{4}{9}$

$= \frac{2}{9}$

$= 0,222$

9.2 2. $P(P \text{ and } G)$

$= P(PG) + P(GP)$

$= \frac{3}{10} \times \frac{2}{9} + \frac{2}{10} \times \frac{3}{9}$

$= \frac{1}{15} + \frac{1}{15}$

$= \frac{2}{15}$

$= 0,133$

9.3. 1. 60 B 60 G

50 B S 20 G NS

	S	NS	Σ
B	50	10	60
G	40	20	60
Σ	90	30	120

9.3. 2(a) $P(G\,S)$

$= \frac{40}{120}$

$= \frac{1}{3}$

9.3. 2(b) $P(NS\ NF)$

$= P(NS\ B)$

$= \frac{10}{120}$

$= \frac{1}{12}$