NORTH SYDNEY BOYS HIGH SCHOOL

STAGE 5.3 MATHEMATICS

Year 10 Assessment Task 4 2022

General Instructions

- Working time – 100 **minutes**
- Write using blue or black pen.
- **NESA approved** calculators are allowed.
- All necessary working should be shown in every question. Marks may not be awarded for carelessly or badly arranged work.
- Attempt **all** questions.

Class (please ✓)

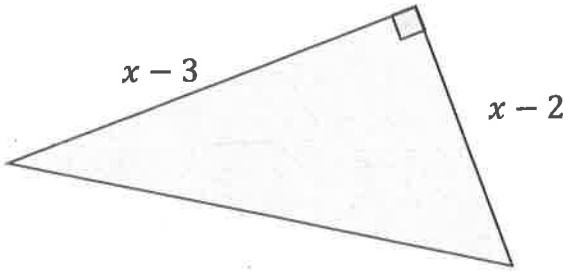
- ☐ 10MAT.A – Dr Vranesevic
- ☐ 10MAT.B – Mr Ireland
- ☐ 10MAT.C – Mr Umakanthan
- ☐ 10MAT.D – Ms Moss
- ☐ 10MAT.E – Ms Fu

Name: _____

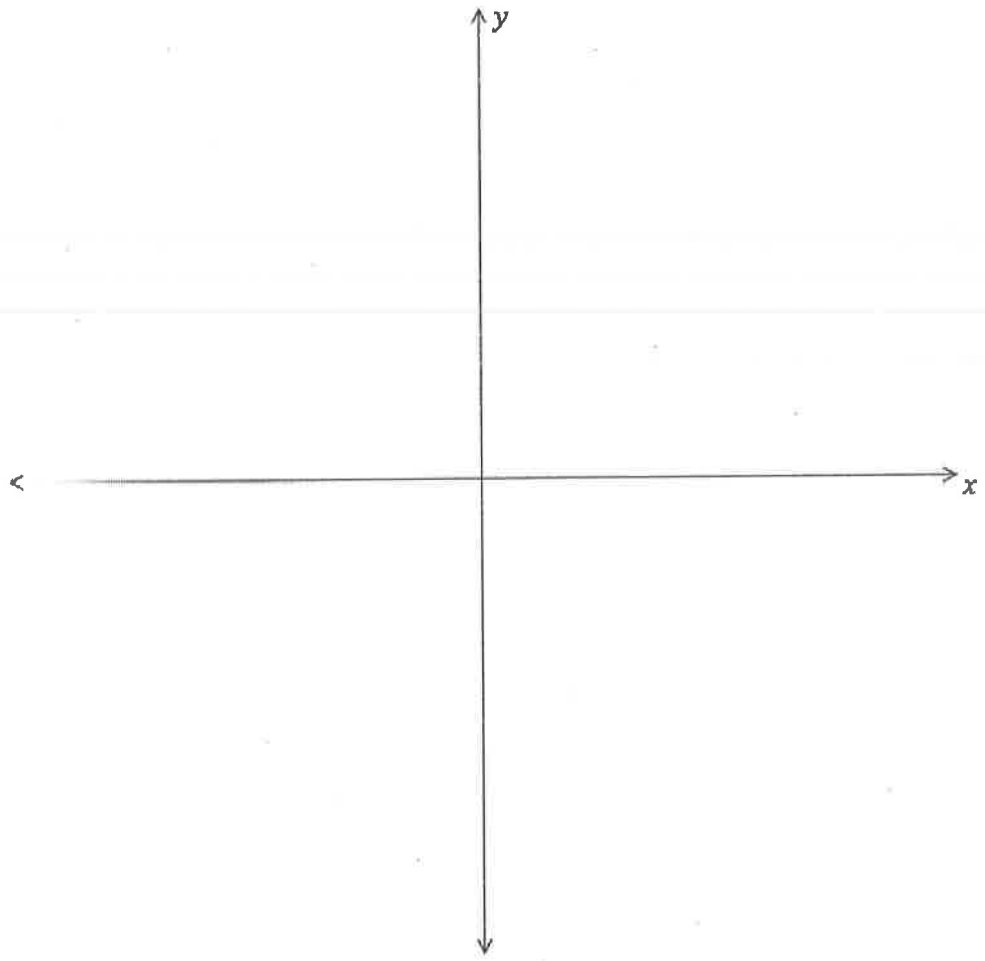
(To be used by the exam markers only.)

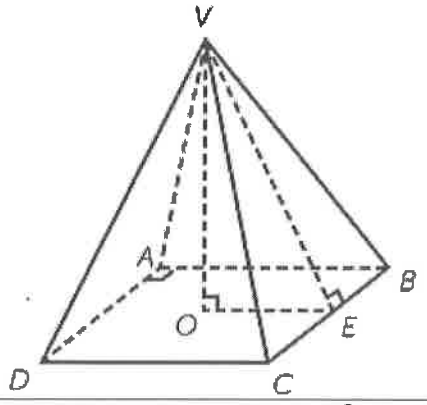
Section	I	II	III	IV	V	VI	VII	VIII	IX	X	Total	Total %
Marks	9	7	6	10	9	10	6	14	14	10	95	

Section I (9 marks)		Marks
1.	Simplify, rationalising your answer:	
	$$\frac{8}{3-\sqrt{7}}-\frac{6}{2\sqrt{7}-4}$$	2
2.	Solve:	
	a) $$2x^2+5x-18=0$$	2
	b) $$\frac{1}{x}+\frac{1}{x+1}=\frac{5}{6}$$	2

3.	The area of a triangle with side lengths of $(x-3)$ and $(x-2)$ as shown below is $10\ cm^2$. Find the possible value/s of x  	3

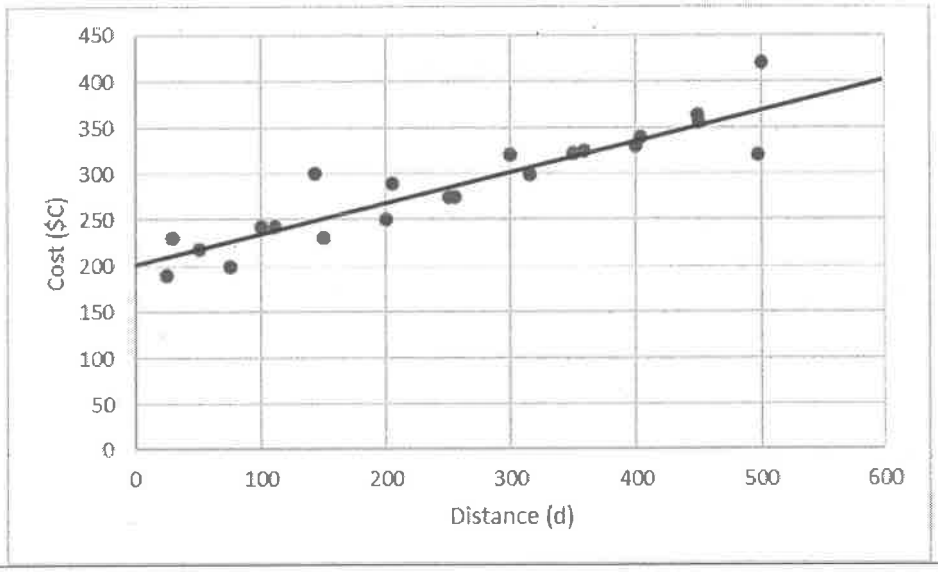
Section II (7 marks)		
4.	The diameter of a circle has endpoints $A(-1, 2)$ and $B(5, 6)$.	
	a) Find the coordinates of the centre of the circle	1
	b) Find the length of the radius	2
	c) State the equation of the circle	1

5.	Sketch the region defined by the following inequalities:	3
	$y > -2 - x$ $y \leq 1$ $x \leq 0$	
		

Section III (6 marks)		
6.	The base edge BC of a square pyramid is $20cm$. 	
	a) If the surface area of this pyramid is $1600cm^2$, find the perpendicular height, VE, of the triangular face.	2
	b) Find the perpendicular height, VO, of the pyramid. Leave your answer in exact form.	1
	c) Find the volume of the pyramid	1
	d) A second similar pyramid has a base edge of $15a\ cm$. What is the volume of the second pyramid, in terms of a?	2

Section IV (10 marks)

7. A company tracks the relationship between the distance d in kilometres a truck has travelled the running costs $\$C$ of the trip. The figures for 20 trips are shown on the graph below, along with a line of best fit.



a) Which is the independent variable? 1

b) Find the gradient of the line of best fit and explain what the gradient represents 2

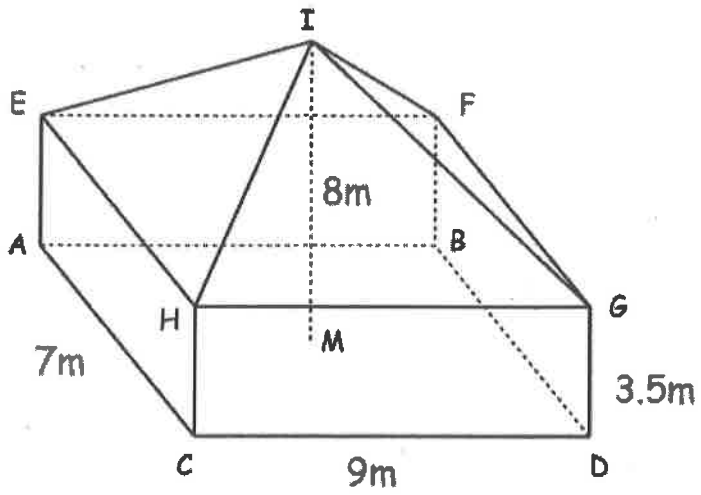
c) Find the vertical intercept and explain what the value represents 2

d) Using the line of best fit Predict the running costs of the truck if it travels 450 km. 1

e) Calculate the distance travelled by the truck if the running costs were \$687, to the nearest km. 1

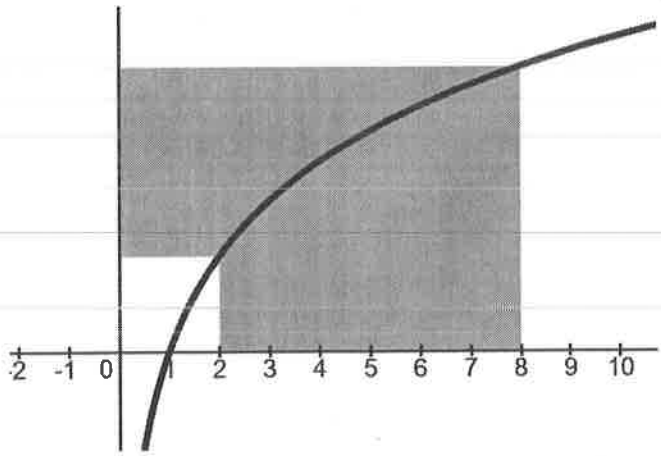
8.	In a school test involving all of Year 10, the mean was 55 and the standard deviation was 6. It can be assumed that the marks are normally distributed.	
	a) Sam scored 70 marks in the test. What was Sam's z-score?	1
	b) Connor had a goal to be in the top 20% of the class. He scored 62 marks. Using calculations, determine whether Connor achieved his goal.	2

Section V (9 marks)		
9.	A cliff is 70 metres high. The angle of depression of a fishing boat, as seen from the top of the cliff is 32°. How far is the boat from the base of the cliff? Answer to the nearest metre.	1
10.	In ΔABC, sides $c = 24, b = 31$ and angle $ABC = 60°$.	
	a) Draw ΔABC, labelling with the information given	1
	b) Find angle ACB, correct to the nearest minute	3

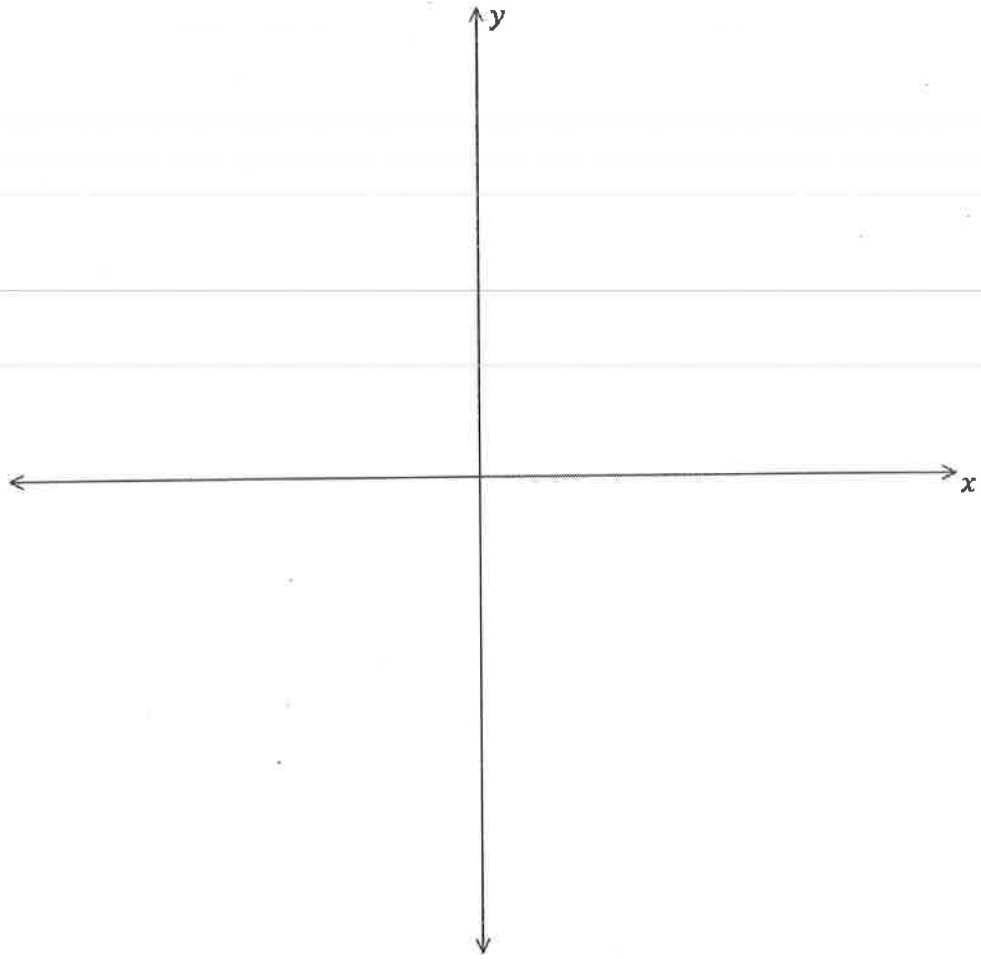
11.	The diagram shows a cuboid and a pyramid. The apex of the pyramid, I, is directly above the centre, M, of $ABDC$.	
		
	a) Calculate the angle between the line DI and the plane $ABDC$	2
	b) Calculate the angle between planes EHI and ACHE	2

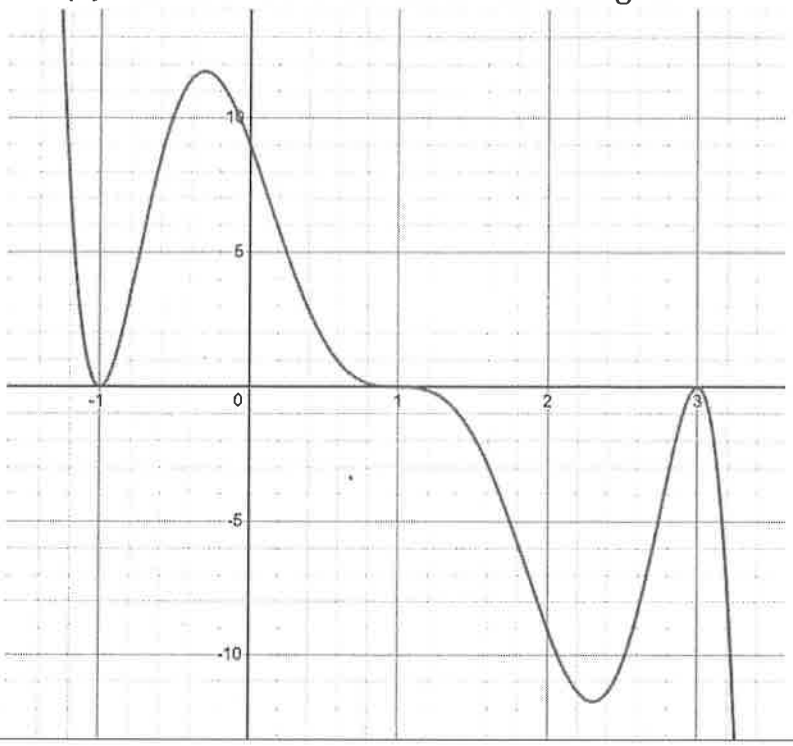
Section VI (10 marks)		
12.	A group of 60 students is surveyed about their activities over the weekend. 27 students played sport, 13 students read books and 38 studied for their maths exam. 5 students did all 3 activities, 12 played sport and studied, 8 studied and read books and 9 read books and played sport.	
	a) Draw a Venn diagram to represent this information	2
	b) What is the probability that a randomly selected student did none of the activities	1
	c) Given that a randomly selected student read books, what is the probability that they also played sport?	2

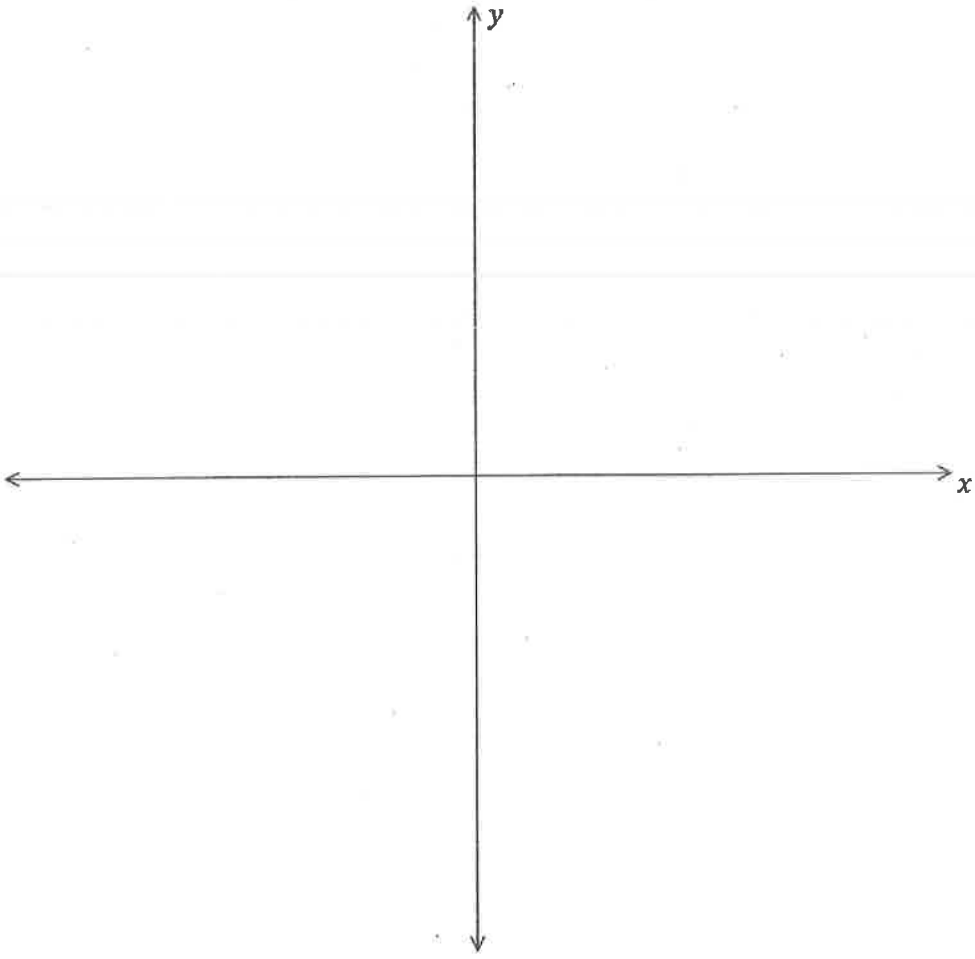
13.	Five cards are numbered 1, 2, 3, 4 and 5 respectively. One card is drawn, without replacement and then a second card is drawn. Find the probability that:	
	a) The sum of the two cards is 6	1
	b) The face value of each of the two cards is greater than 3	1
	c) The face value of the first card is 2 or 5	1
	d) Given that the sum of the two cards is even, what are the chances that the first card is odd?	2

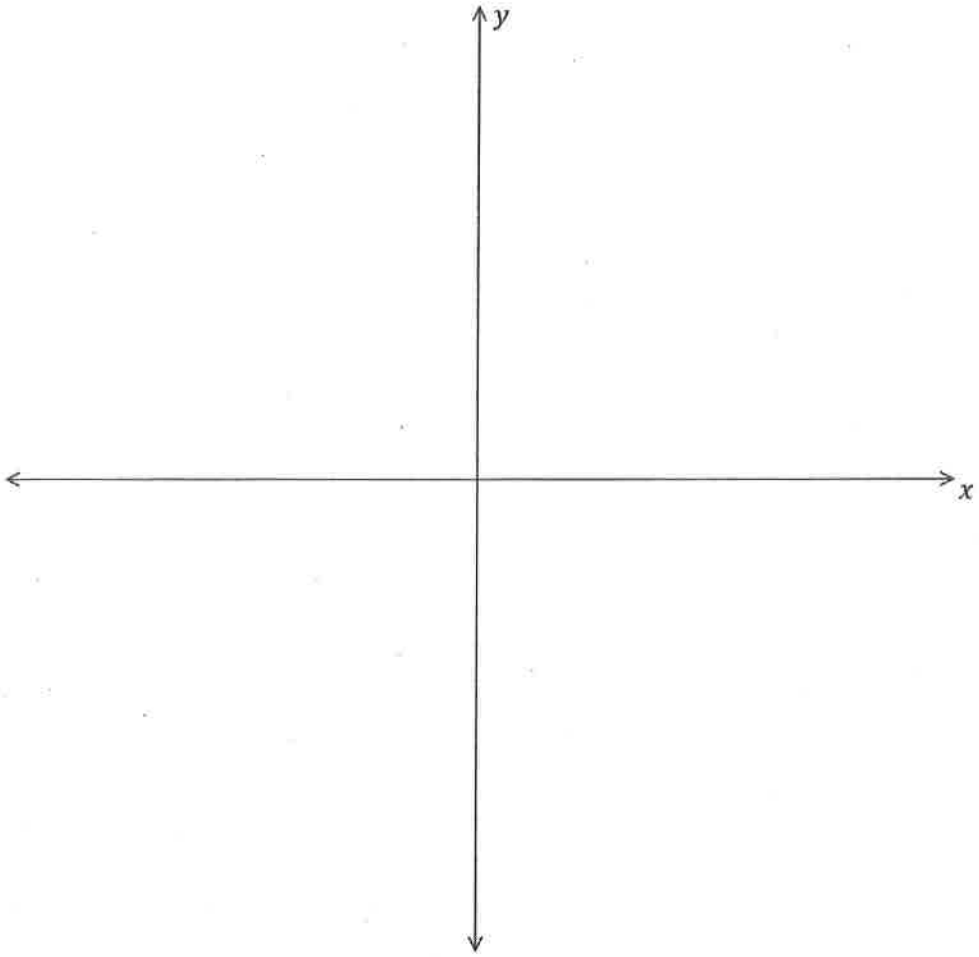
Section VII (6 marks)		
14.	Solve the following equations for x	
	a) $3^{2x-1} = 243$	1
	b) $\log x + \log(2x + 1) = \log 6$	3
15.	The diagram shows the curve $y = \log_2 x$. Using the information on the diagram, find the shaded area.  	2

Section VIII (14 marks)		
16.	Given $P(x) = 2x - 1$ and $Q(x) = x^2 - 2x + 1$ find	
	a) $P(x)Q(x)$	1
	b) $Q(x) - 2P(x)$	2
17.	Divide $P(x) = 4x^4 + 3x^3 - 2x^2 + x + 5$ by $(x^2 + 1)$, expressing your result in the form $P(x) = D(x)Q(x) + R(x)$	2

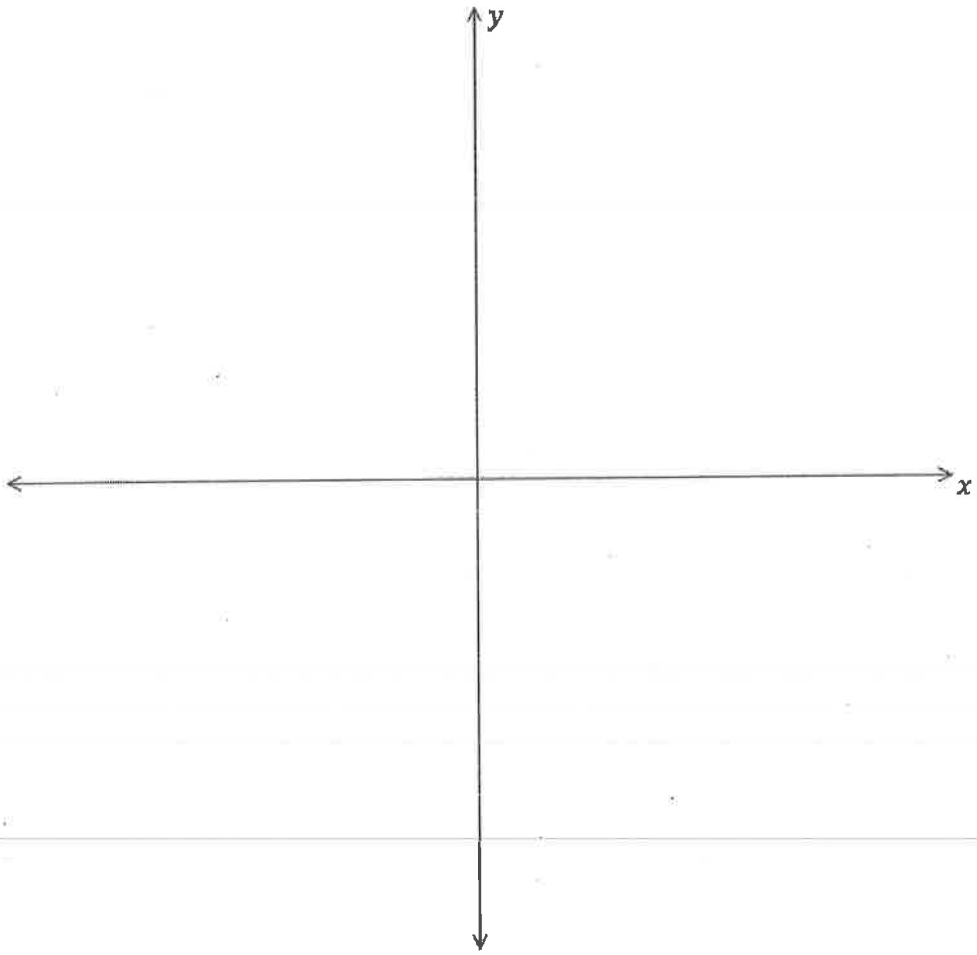
18.	Given $P(x) = x^4 - 5x^2 + 4$	
	a) Factorise $P(x)$ into linear factors	2
	b) Sketch $P(x)$ showing all important features	3
		

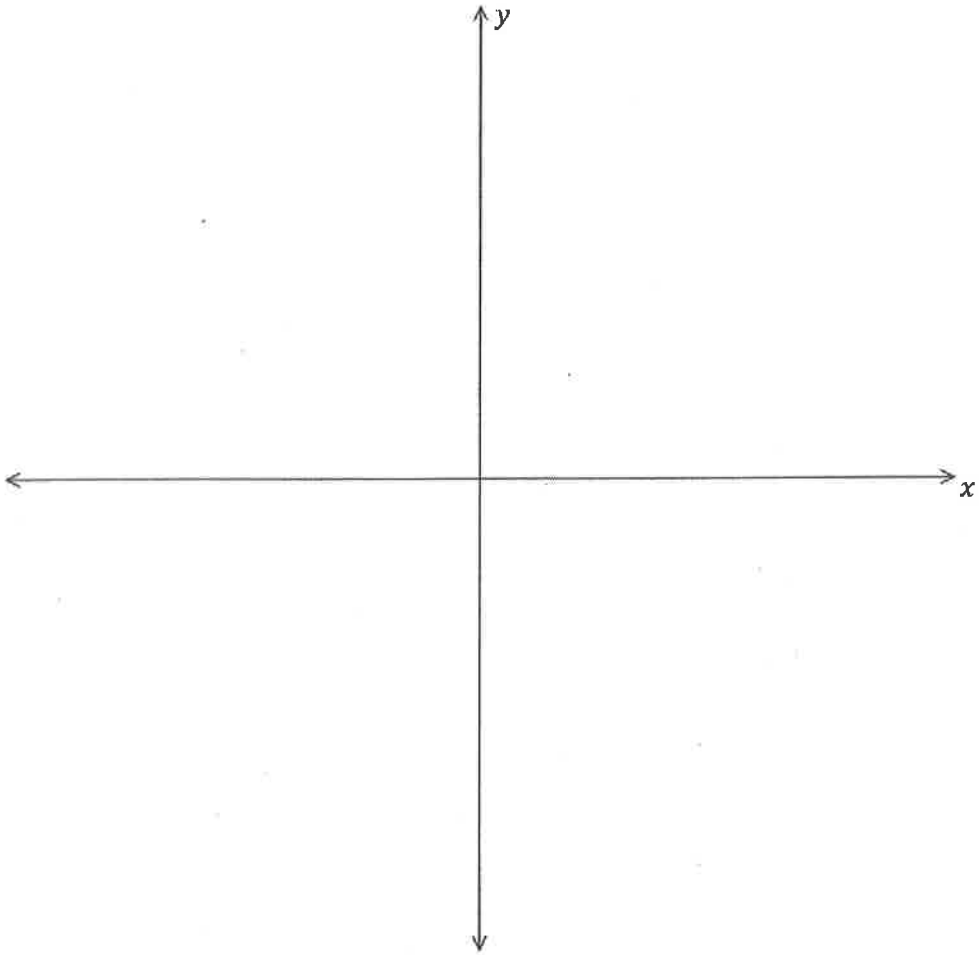
19.	The polynomial $P(x)$ shown below is known to have a degree of 7.  	
	a) Write the equation of the polynomial in factored form.	2
20.	Find the values of a and b if $x^3 + ax^2 + bx - 30$ is divisible by $(x - 3)$ but leaves a remainder of -8 when divided by $(x - 1)$.	2

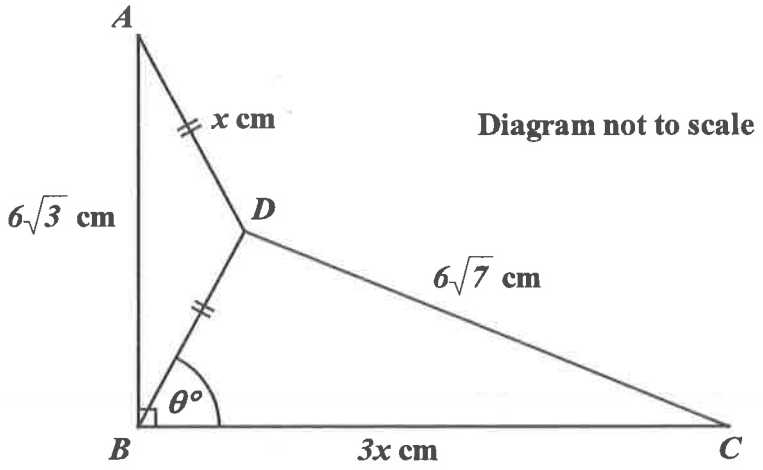
Section IX (14 marks)		
21.	Considering the parabola $y = 2x^2 - 3x + 8$	
	a) By completing the square, state the equation of the parabola in Vertex Form	2
	b) Sketch the parabola, showing all important points	2
		

22.	Given $f(x) = 2^x - 3$	
	a) Sketch $f(x)$ 	3
	b) State the domain and range of $f(x)$	1
	c) Find the inverse function $f^{-1}(x)$	2

23.	Sketch the following graphs, showing all important features:	
	a) $y = (x-2)^3 + 1$	2



	b) $xy = -4$ 	2

	Section X (10 marks)	
24.	 Given that $AD = DB = x\ cm$, $BC = 3x\ cm$, $AB = 6\sqrt{3}\ cm$, $CD = 6\sqrt{7}\ cm$ and $\angle DBC = \theta°$	
	a) By using the cosine rule in ΔDBC, show that: $$\cos\theta = \frac{5x^2 - 126}{3x^2}$$	2
	b) By considering ΔADB, show that: $$\sin\theta = \frac{\sqrt{27}}{x}$$	2

	c) Hence, using parts a) and b) and the identity $\sin^2\theta + \cos^2\theta = 1$, show that $16x^4 - 1017x^2 + 15876 = 0$.	2
	d) Find all possible values of x.	2
	e) Given x is an integer, find the exact value of θ.	2

END OF EXAMINATION

2022 - 410 Task 4 (Yearly) – Suggested Solutions

Section I (9 marks)		Marks
1.	Simplify, giving a rational answer:	
	a)	2

$$= \frac{8}{3-\sqrt{7}} \times \frac{3+\sqrt{7}}{3+\sqrt{7}} - \frac{6}{2\sqrt{7}-4} \times \frac{2\sqrt{7}+4}{2\sqrt{7}+4} \quad \checkmark$$

$$= \frac{24+8\sqrt{7}}{9-7} - \frac{12\sqrt{7}+24}{28-16}$$

$$= 12+4\sqrt{7} - (\sqrt{7}+2)$$

$$= 10+3\sqrt{7} \quad \checkmark$$

2.	Solve:	
	a)	2

$$2x^2+5x-18=0$$

$$2x^2+9x-4x-18=0$$

$$2x(x-2)+9(x-2)=0$$

$$(2x+9)(x-2)=0 \quad \checkmark$$

$$2x=-9 \quad x=2$$

$$x=-9/2 \quad \checkmark$$

	b)	2

$$\frac{1}{x}+\frac{1}{x+1}=\frac{5}{6} \qquad x\neq 0,\ x\neq -1$$

$$6(x+1+x) = 5x(x+1)$$

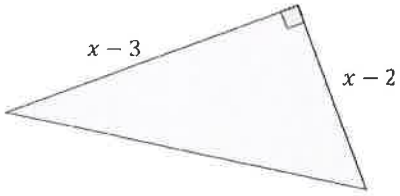
$$12x+6 = 5x^2+5x$$

$$0 = 5x^2-7x-6 \quad \checkmark$$

$$= 5x^2-10x+3x-6$$

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

$$x=-3/5 \text{ or } x=2 \quad \checkmark$$

3.	The area of a triangle with side lengths of $(x-3)$ and $(x-2)$ as shown below is $10\ cm^2$. Find the possible value/s of x 	3

$10 = \frac{1}{2}(x-3)(x-2)$ ✓

$20 = x^2 - 5x + 6$

$0 = x^2 - 5x - 14$

$= (x-7)(x+2)$ ✓

$\therefore x = 7 \quad \text{or} \quad x = -2$

but $x - 3 > 0$

$\therefore x = 7\,cm$ ✓

9

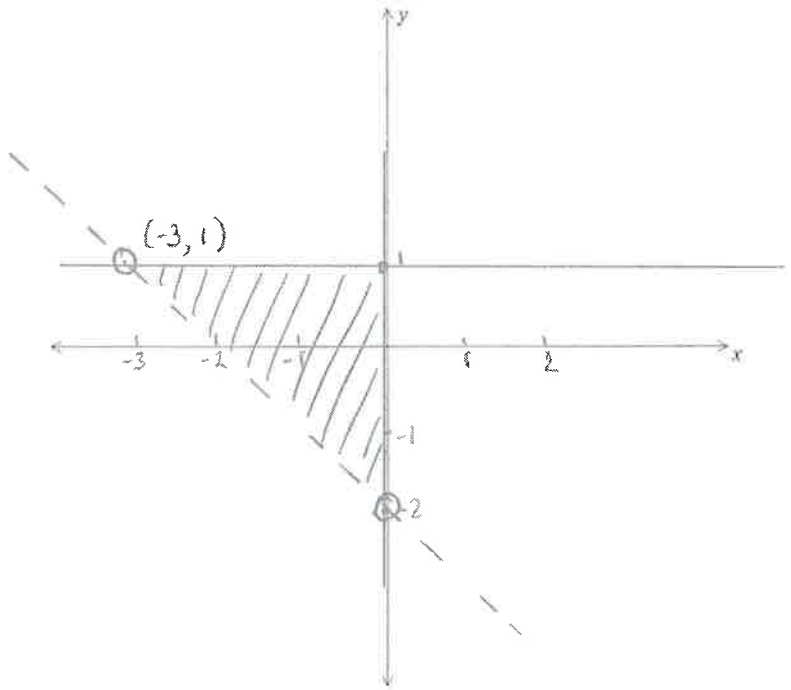
Section II (7 marks)		
4.	The diameter of a circle has endpoints $A(-1,2)$ and $B(5,6)$.	
	a) Find the coordinates of the centre of the circle	1
	$\left(\frac{-1+5}{2}, \frac{2+6}{2}\right) = (2,4)$ ✓	
	b) Find the length of the radius	2
	$r = \sqrt{(2--1)^2+(4-2)^2}$ ✓ $= \sqrt{9+4}$ $= \sqrt{13}$ ✓	
	c) State the equation of the circle	1
	$(x-2)^2+(y-4)^2 = 13$ ✓	

5.	Sketch the region defined by the following inequalities:	3

$$y > -2 - x$$
$$y \leq 1$$
$$x \leq 0$$

$1 = -2 - x$ $\quad x = -3$

$y = -2 - 0$ $\quad = -2$



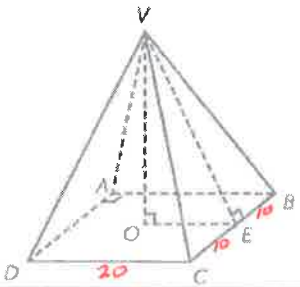
- lines
- region
- boundary points

✓✓✓

7

Section III (6 marks)

6. The base edge BC of a square pyramid is $20cm$.



a) If the surface area of this pyramid is $1600cm^2$, find the perpendicular height, VE, of the triangular face. 2

$SA = 400 + 4 \times \frac{1}{2} \times 20 \times VE$

$1600 = 400 + 40VE$

$1200 = 40VE$

$VE = 30\,cm$ ✓✓

b) Find the perpendicular height, VO, of the pyramid. Leave your answer in exact form. 1

$30^2 = 10^2 + VO^2$

$VO^2 = 800$

$VO = \sqrt{800}$

$= 20\sqrt{2}$ ✓

c) Find the volume of the pyramid 1

$V = \frac{1}{3}Ah$

$= \frac{1}{3} \times 400 \times 20\sqrt{2}$

$= \frac{8000\sqrt{2}}{3}\,cm^3$ ✓

d) A second similar pyramid has a base edge of $15a\,cm$. What is the volume of the second pyramid, in terms of a? 2

Sides $15a : 20$

$3a : 4$

Volume $27a^3 : 64$ ✓

$V = \frac{8000\sqrt{2}}{3} \times \frac{27a^3}{64}$

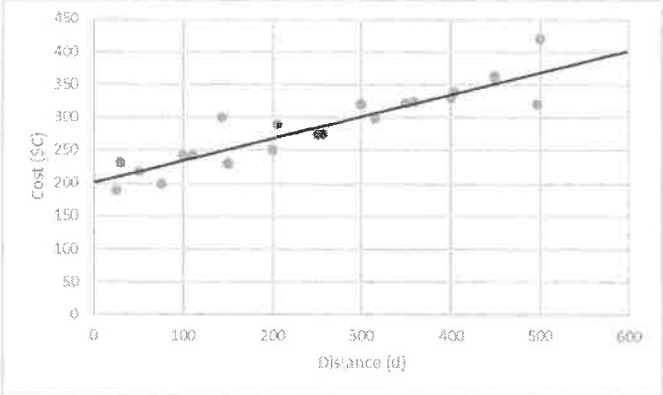
$= 125 \times 9\sqrt{2}\,a^3$

$= 1125\sqrt{2}\,a^3\,cm^3$ ✓

6

Section IV (10 marks)

7. A company tracks the relationship between the distance d in kilometres a truck has travelled the running costs $\$C$ of the trip. The figures for 20 trips are shown on the graph below, along with a line of best fit.



a) Which is the independent variable? 1

Distance ✓

b) Find the gradient of the line of best fit and explain what the gradient represents 2

$m = \frac{400-200}{600}$

$= \frac{1}{3}$ Cost per km travelled. ✓✓

c) Find the vertical intercept and explain what the value represents 2

$200 - cost of owning the truck, ✓

even when not using. ✓

d) Using the line of best fit Predict the running costs of the truck if it travels 500 km 1

450

$350

$C = \frac{d}{3} + 200 = \$350$ ✓

e) Calculate the distance travelled by the truck if the running costs were $687, to the nearest km. 1

$687 = \frac{x}{3} + 200$

$487 = \frac{x}{3}$ $x = 1461$ km ✓

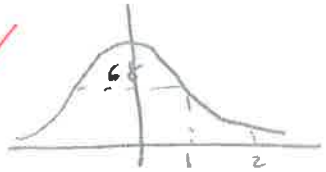
8.	In a school test involving all of Year 10, the mean was 55 and the standard deviation was 6. It can be assumed that the marks are normally distributed.	
	a) Sam scored 70 marks in the test. What was Sam's z-score?	1
	b) Connor had a goal to be in the top 20% of the class. He scored 62 marks. Using calculations, determine whether Connor achieved his goal.	2

$z = \frac{70 - 55}{6}$

$= 2.5$ ✓

$z = \frac{62 - 55}{6}$ ✓

$= 7/6$



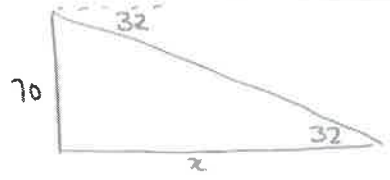
He is in the top 16%.

Therefore he achieved his goal ✓

/10

Section V (9 marks)

9. A cliff is 70 metres high. The angle of depression of a fishing boat, as seen from the top of the cliff is 32°. How far is the boat from the base of the cliff? 1



$\tan 32 = \frac{70}{x}$ ✓

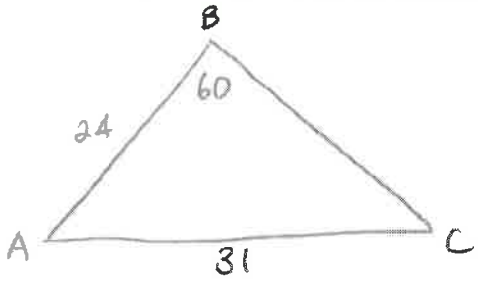
$x = \frac{70}{\tan 32}$

$= 112$ m (nearest m)

to the nearest metre

10. In ΔABC, sides $c = 24, b = 31$ and angle $ABC = 60°$.

a) Draw ΔABC, labelling with the information given 1



✓

b) Find angle ACB, correct to the nearest minute 3 ?

$\frac{\sin(ACB)}{24} = \frac{\sin 60}{31}$ ✓

$\sin ACB = \frac{24 \sin 60}{31}$

$= 0.67...$

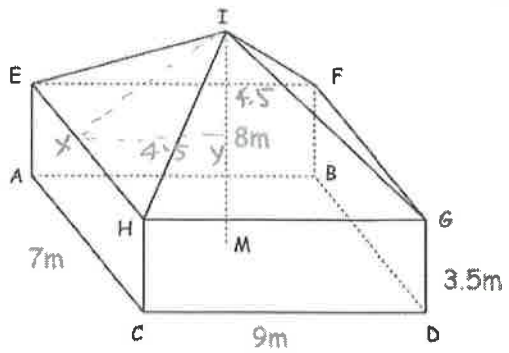
$\angle ACB = 42°6'$ ✓✓

$180 - 42° = 138°$

→ not a Δ ..

one answer.

11. The diagram shows a cuboid and a pyramid. The apex of the pyramid, I, is directly above the centre, M, of $ABDC$.



a) Calculate the angle between the line DI and the plane $ABDC$ — nearest degree

$AD^2 = 7^2 + 9^2$

$= 130$

$AD = \sqrt{130}$

$MD = \frac{\sqrt{130}}{2}$

$\tan \angle IDM = \frac{8}{\sqrt{130}/2}$

$= \frac{16}{\sqrt{130}} \doteq 1.4033$

$\angle IDM = 55°$ ✓✓

b) Calculate the angle between planes EHI and ACHE (2)

See diagram $\angle IXY$ is 45°

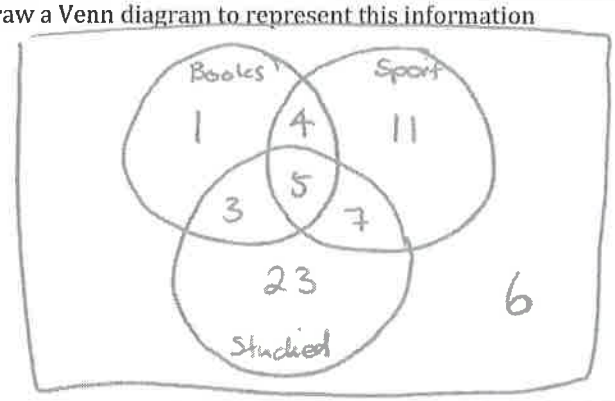
$90 + 45° = 135°$ ✓✓

9

Section VI (10 marks)

12. A group of 60 students is surveyed about their activities over the weekend. 27 students played sport, 13 students read books and 38 studied for their maths exam. 5 students did all 3 activities, 12 played sport and studied, 8 studied and read books and 9 read books and ~~studied.~~ played sport

a) Draw a Venn diagram to represent this information — 2



✓✓

b) What is the probability that a randomly selected student did none of the activities — 1

$P(\text{none}) = \frac{6}{60}$

$= \frac{1}{10}$ or 10 % (or 0.1)

✓

c) Given that a randomly selected student read books, what is the probability that they also played sport? — 2

$n(\text{Books}) = 13$

$n(\text{Books} + \text{sport}) = 9$

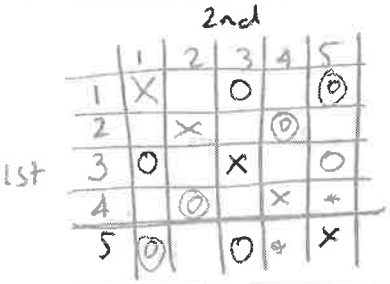
$\therefore P(B \mid \text{Sport}) = \frac{9}{13}$

✓✓

13. Five cards are numbered 1, 2, 3, 4 and 5 respectively. One card is drawn, without replacement and then a second card is drawn. Find the probability that:

a) The sum of the two cards is 6 ○ — 1

$n(\text{outcomes}) = 5 \times 4 = 20$



$P(\text{sum } 6) = \frac{4}{20} = \frac{1}{5}$ ✓

b) The face value of each of the two cards is greater than 3 — 1

$P(\text{both} > 3) = \frac{2}{20} = \frac{1}{10}$ or 10%. ✓

c) The face value of the first card is 2 or 5 — 1

$P(\text{1st 2 or 5}) = \frac{2}{5}$ or 40%. ✓

d) Given that the sum of the two cards is even, what are the chances that the first card is odd? — 2

8 even sums. Of those, ~~four~~ 6 have an odd first card

$\therefore P(\text{1st odd} \mid \text{even sum}) = \frac{6}{8} = \frac{3}{4}$ ✓✓

or 75%

10

ie.
1+3, 1+5,
2+4,
3+1, 3+5,
4+2,
5+1, 5+3.

1st \ 2nd	1	2	3	4	5
1	·		E		E
2		·		E	
3	E		·		E
4		E		·	
5	E		E		·

Section VII (5 marks)

14. Solve the following equations for x

a) $3^{2x-1} = 243$ — 1

$3^{2x-1} = 3^5$

$2x - 1 = 5$ ✓

$x = 3$

b) $\log_{10} x + \log_{10}(2x+1) = \log_{10} 6$ — 3

$\frac{x}{2x+1} = 4$

$x = 8x + 4$

$0 = 7x + 4$

$x = -4/7$ but $x > 0$

$x(2x+1) = 6$ ✓

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

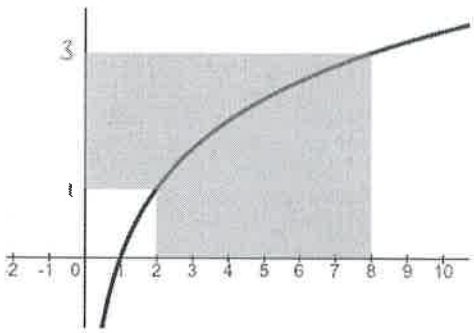
$(2x-3)(x+2) = 0$

$x = 3/2 \quad x = -2$ ✓

But $\log(-2)$ not possible

$\therefore x = \frac{3}{2}$ ✓

15. The diagram shows the curve $y = \log_2 x$. Using the information on the diagram, find the shaded area. — 2



$A = 6 \times 3 + 2 \times 2$

$= 22 \text{ u}^2$ ✓✓

(or, $A = 3 \times 8 - 1 \times 2$

$= 22 \text{ u}^2$.)

6

Section VIII (15 marks)

16. Given $P(x) = 2x - 1$ and $Q(x) = x^2 - 2x + 1$ find

a) ~~$P(x) + Q(x)$~~ — 1

b) $P(x)Q(x) = (2x-1)(x^2-2x+1)$ — 1

$= 2x^3 - 4x^2 + 2x - x^2 + 2x - 1$

$= 2x^3 - 5x^2 + 4x - 1$ ✓

c) $Q(x) - 2P(x) = x^2 - 2x + 1 - 2(2x-1)$ — 2

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

$= x^2 - 6x + 3$ ✓✓

17. Divide $P(x) = 4x^4 + 3x^3 - 2x^2 + x + 5$ by $(x^2 + 1)$, expressing your result in the form $P(x) = D(x)Q(x) + R(x)$ — 2

$$
\begin{array}{r}
4x^2 + 3x - 6 \\
x^2+1 \overline{)\,4x^4 + 3x^3 - 2x^2 + x + 5} \\
4x^4 \quad\quad + 4x^2 \\
\hline
3x^3 - 6x^2 + x \\
3x^3 \quad\quad + 3x \\
\hline
-6x^2 - 2x + 5 \\
-6x^2 \quad\quad - 6 \\
\hline
-2x + 11
\end{array}
$$

$P(x) = (x^2+1)(4x^2 + 3x - 6) - 2x + 11$ ✓ ✓

18. Given $P(x) = x^4 - 5x^2 + 4$

a) Factorise $P(x)$ into linear factors — 2

$P(1) = 0 \quad \therefore x - 1$ is a factor

$P(-1) = 0 \quad \therefore x + 1$ is a factor

$P(x) = (x-1)(x+1)Q(x)$

$$x^2 - 1 \overline{)\, x^4 - 5x^2 + 4}$$

$x^2 - 4$

$x^4 - x^2$

$-4x^2 + 4$

$-4x^2 + 4$

0

$\therefore P(x) = (x-1)(x+1)(x-2)(x+2)$ ✓✓

alt let $x^2 = u$

$u^2 - 5u + 4$

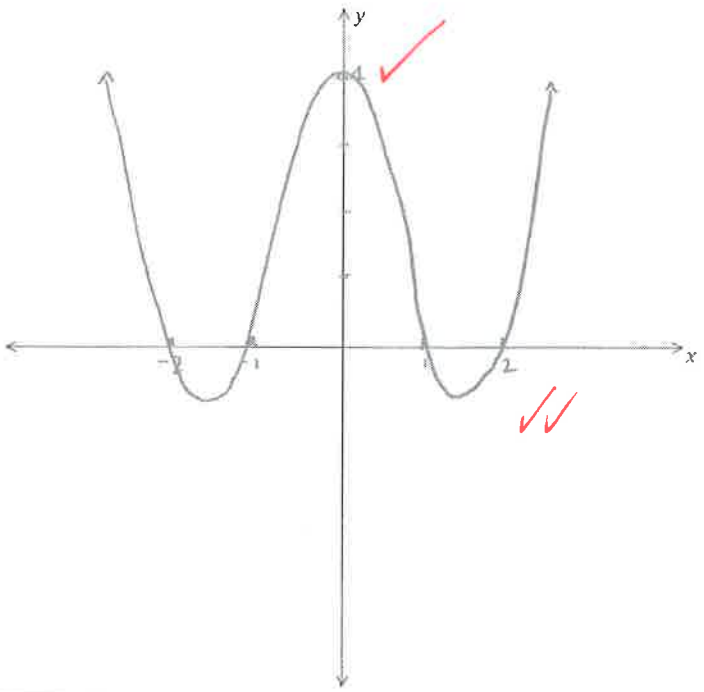
$(u-4)(u-1)$

$\therefore (x^2-4)(x^2-1)$

$\therefore (x-2)(x+2)$

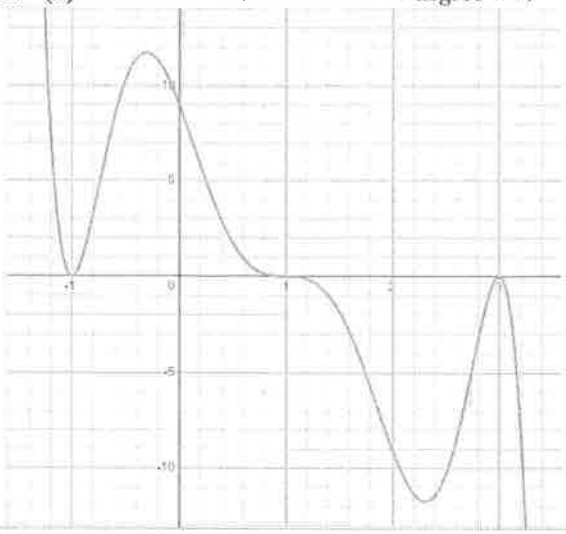
$(x-1)(x+1)$

b) Sketch $P(x)$ showing all important features — 3



✓✓

19. The polynomial $P(x)$ shown below is known to have a degree of 7.



a) Write the equation of the polynomial in factored form. 2

$P(x) = a(x+1)^2(x-1)^3(x-3)^2$

$9 = a(1)^2(-1)^3(-3)^2$

$= -9a$

$a = -1$

$P(x) = -(x+1)^2(x-1)^3(x-3)^2$ ✓✓

20. Find the values of a and b if $x^3 + ax^2 + bx - 30$ is divisible by $(x-3)$ but leaves a remainder of -8 when divided by $(x-1)$. 2

$P(3) = 0$

$0 = (3)^3 + a(3)^2 + b(3) - 30$

$= 27 + 9a + 3b - 30$

$= 9a + 3b - 3$

$= 3a + b - 1$

$= 3a + 21 - a - 1$

$= 2a + 20$

$a = -10$

$P(1) = -8$

$-8 = (1)^3 + a(1)^2 + b(1) - 30$

$-8 = a + b - 29$

$b = 21 - a$

$b = 21 - (-10)$

$= 31$

$a = -10, \ b = 31$ ✓✓

/14

Section IX (14 marks)

21. Considering the parabola $y = 2x^2 - 3x + 8$

a) By completing the square, state the equation of the parabola in Vertex Form — 2

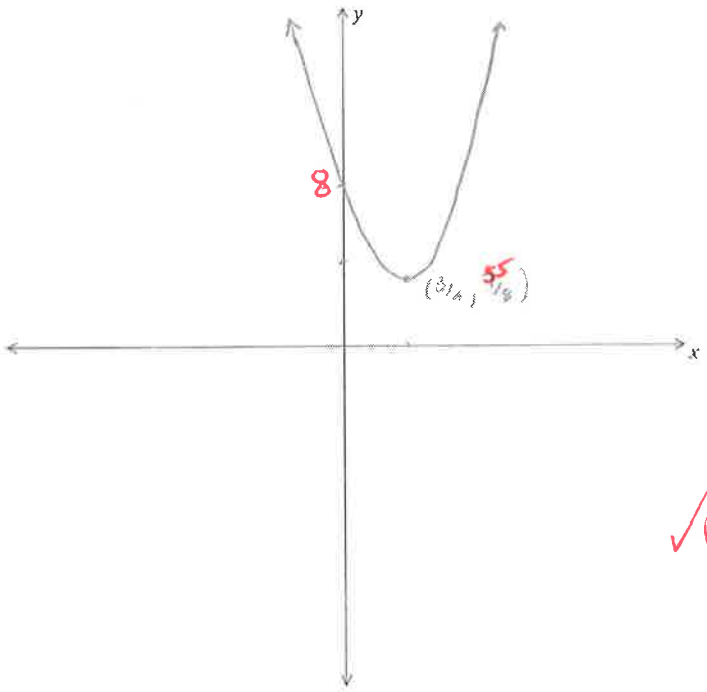
$y = 2\left(x^2 - \frac{3}{2}x + 4\right)$

$= 2\left[x^2 - \frac{3}{2}x + \frac{9}{16} - \frac{9}{16} + 4\right]$

$= 2\left[\left(x - \frac{3}{4}\right)^2 + \frac{55}{16}\right]$

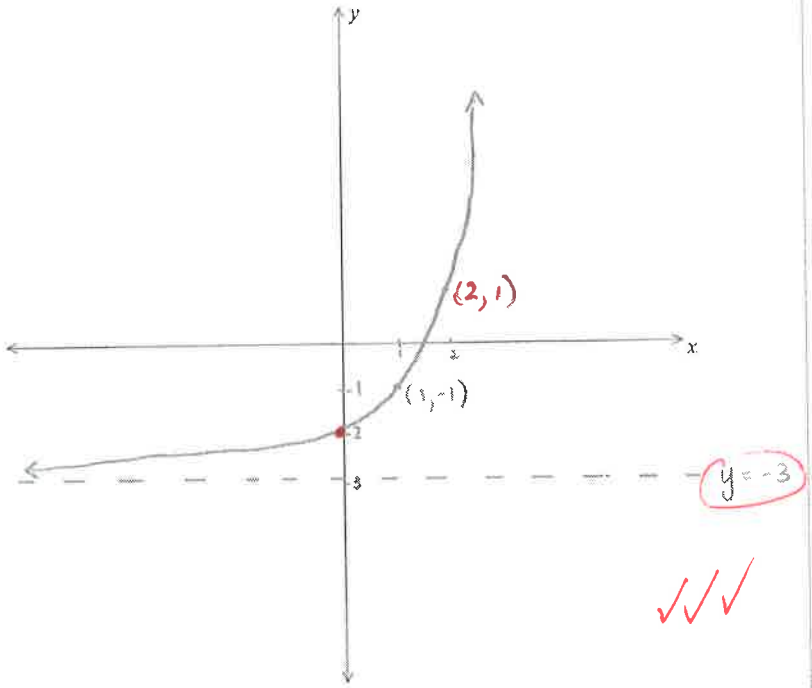
$= 2\left(x - \frac{3}{4}\right)^2 + \frac{55}{8}$

b) Sketch the parabola, showing all important points — 2



22. Given $f(x) = 2^x - 3$

a) Sketch $f(x)$ — 3



✓✓✓

b) State the domain and range of $f(x)$ — 1

D: $-\infty < x < \infty$

R: $-3 < y < \infty$

D: all real x
R: $y > -3$ ✓

c) Find the inverse function $f^{-1}(x)$ — 2

$y = 2^x - 3$

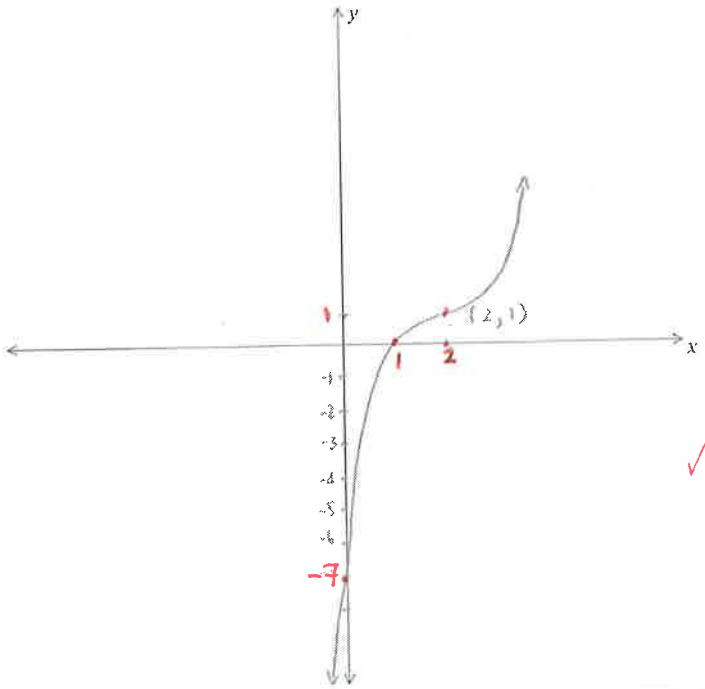
Swap x/y $x = 2^y - 3$

$2^y = x + 3$

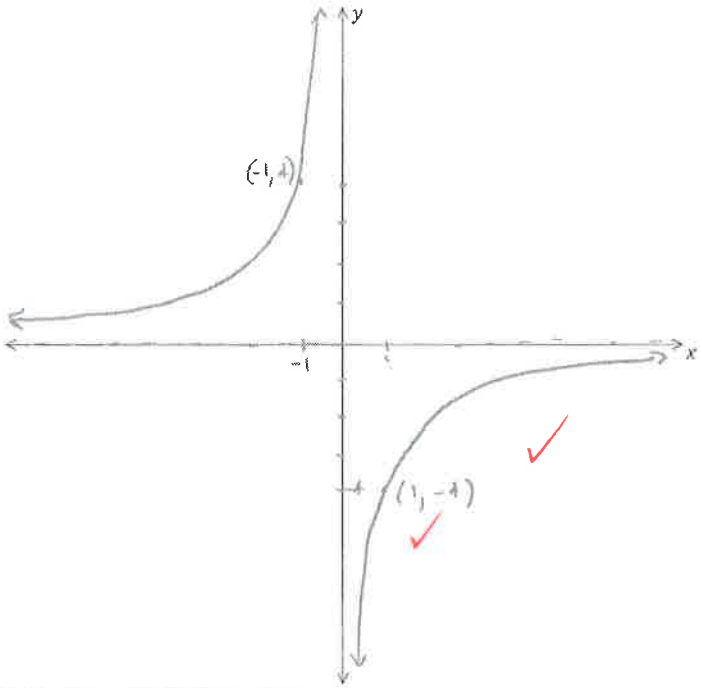
$\log_2 2^y = \log_2 (x+3)$

$y = \log_2 (x+3)$ ✓✓

23.	Sketch the following graphs, showing all important features:	
	a) $y = (x-2)^3 + 1$	2



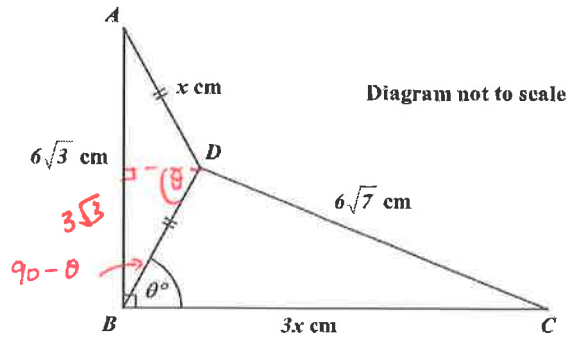
b) $xy = -4$ $y = -\frac{4}{x}$ 2



/14

Section X (10 marks)

24.



Given that $AD = DB = x\,cm$, $BC = 3x\,cm$, $AB =$ [x] cm, $CD =$ [x] cm and $\angle DBC = \theta°$ where $\theta > 70°$

a) By using the cosine rule in ΔDBC, show that:

$$\cos\theta = \frac{5x^2 - 126}{3x^2}$$

2

$\cos\theta = \dfrac{x^2 + (3x)^2 - (6\sqrt{7})^2}{2(x)(3x)}$ ✓

$= \dfrac{x^2 + 9x^2 - 252}{2(3x^2)}$

$= \dfrac{10x^2 - 252}{2 \times 3x^2}$

$= \dfrac{5x^2 - 126}{3x^2}$ ✓

$= RHS$

b) By considering ΔADB, show that:

$$\sin\theta = \frac{\sqrt{27}}{x}$$

2

$\cos(90-\theta) = \dfrac{x^2 + (6\sqrt{3})^2 - x^2}{2(x)(6\sqrt{3})}$ ✓✓

$= \dfrac{(6\sqrt{3})^x}{2x(6\sqrt{3})}$

$= \dfrac{3\sqrt{3}}{x}$

$= \dfrac{\sqrt{27}}{x}$ $= \sin\theta.$

Cosine rule in ΔADB:

alt: from diagram, $\sin\theta = \dfrac{3\sqrt{3}}{x} = \dfrac{\sqrt{27}}{x}$.

alt: use $\angle ADB = 2\theta$, & $\sin 2\theta = 2\sin\theta\cos\theta$ is ok.

c) Hence, using parts a) and b) and the identity $\sin^2\theta + \cos^2\theta = 1$, show that $16x^4 - 1017x^2 + 15876 = 0$. 2

$$\left(\frac{\sqrt{27}}{x}\right)^2 + \left(\frac{5x^2 - 126}{3x^2}\right)^2 = 1$$

$$\frac{27}{x^2} + \frac{25x^4 - 1260x^2 + 15876}{9x^4} = 1$$

$$243x^2 + 25x^4 - 1260x^2 + 15876 = 9x^4$$

$$16x^4 - 1017x^2 + 15876 = 0$$ ✓✓

d) Find all possible values of x. 2

$$x^2 = \frac{1017 \pm \sqrt{(-1017)^2 - 4(15876)(16)}}{32}$$ ✓

$$= \frac{1017 \pm 135}{32}$$

$x^2 = \frac{441}{16}$ or $x^2 = 36$

$x = \pm\frac{21}{4}$ or $x = \pm 6$ but $x > 0$ ✓

$\therefore x = \frac{21}{4}$ or 6.

Hence, exact. if x is integer

e) Find the value of θ, to the nearest degree. 2

$$\cos\theta = \frac{6^2 + 18^2 - (6\sqrt{7})^2}{2 \times 6 \times 18}$$

$$= 0.5$$

$$\theta = 60^\circ$$ ✓✓

alt: $\sin\theta = \frac{3\sqrt{3}}{6}$

$= \frac{\sqrt{3}}{2}$

$\therefore \theta = 60^\circ$.

alt: $\cos\theta = \frac{5(6^2) - 126}{3(6^2)}$

$= 0.5$

$\theta = 60^\circ$.

END OF EXAMINATION

/10