

MATHEMATICS

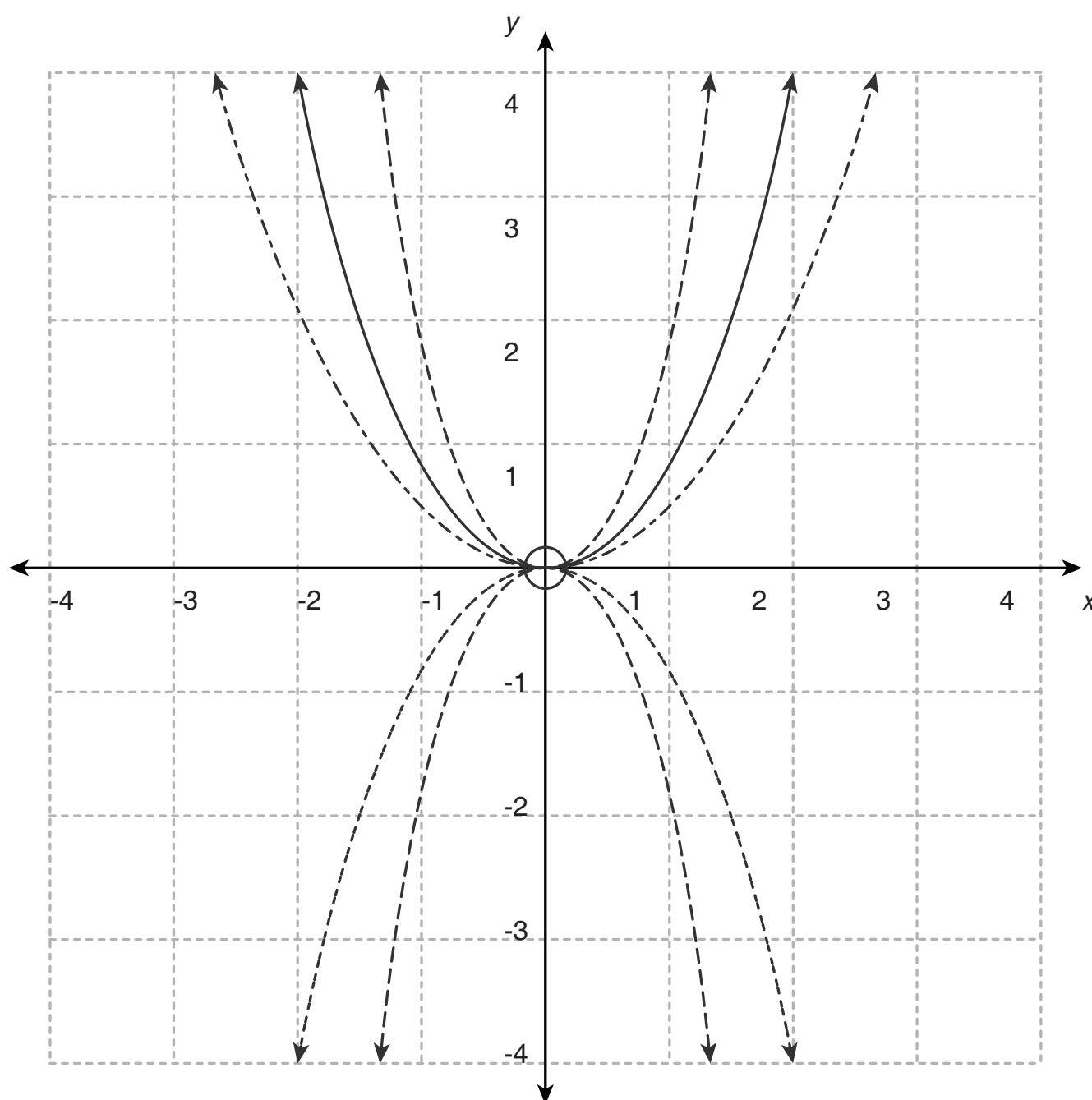
RESOURCE PACK
GRADE 10 TERM 2



FUNCTIONS

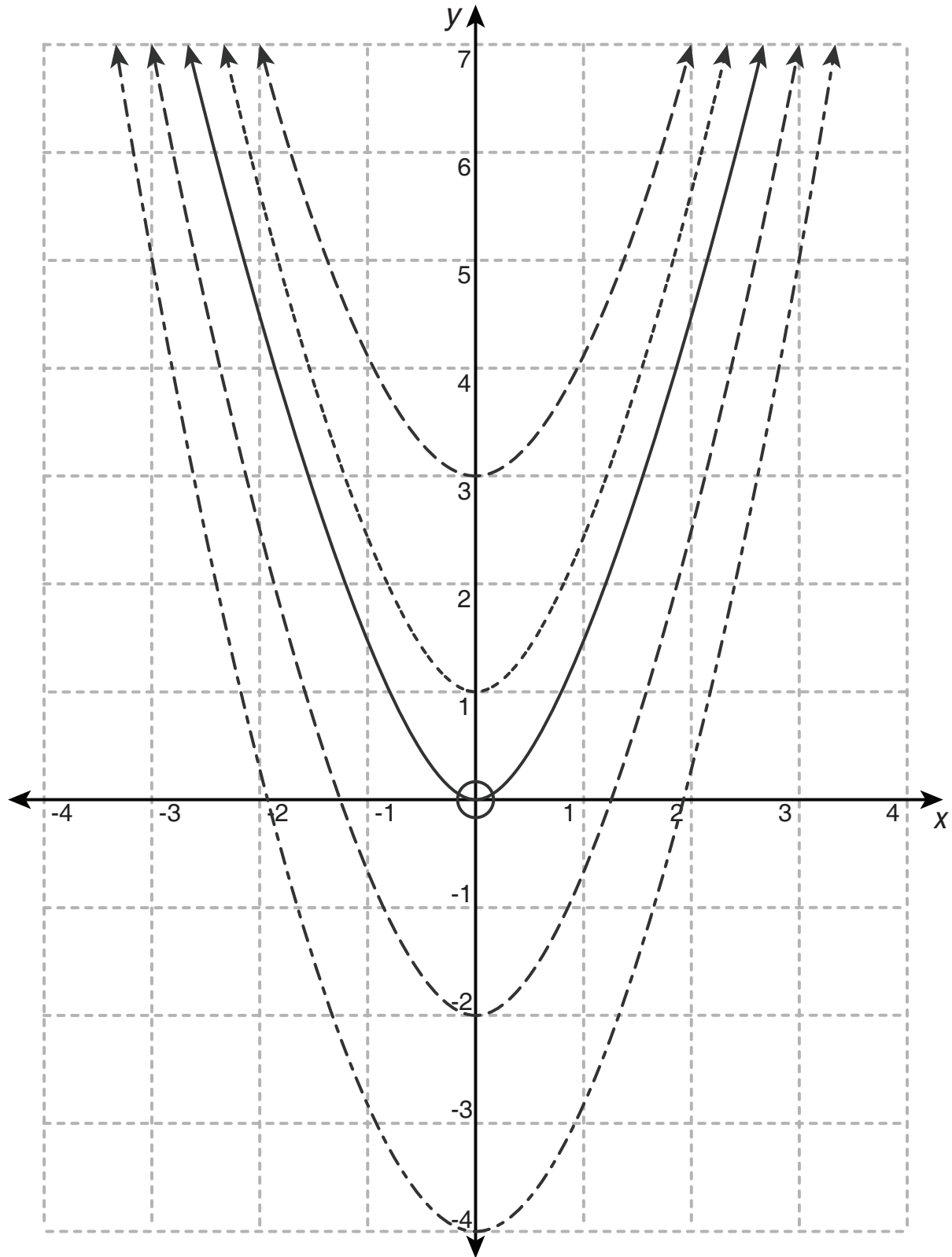
RESOURCE 1

LESSON 4



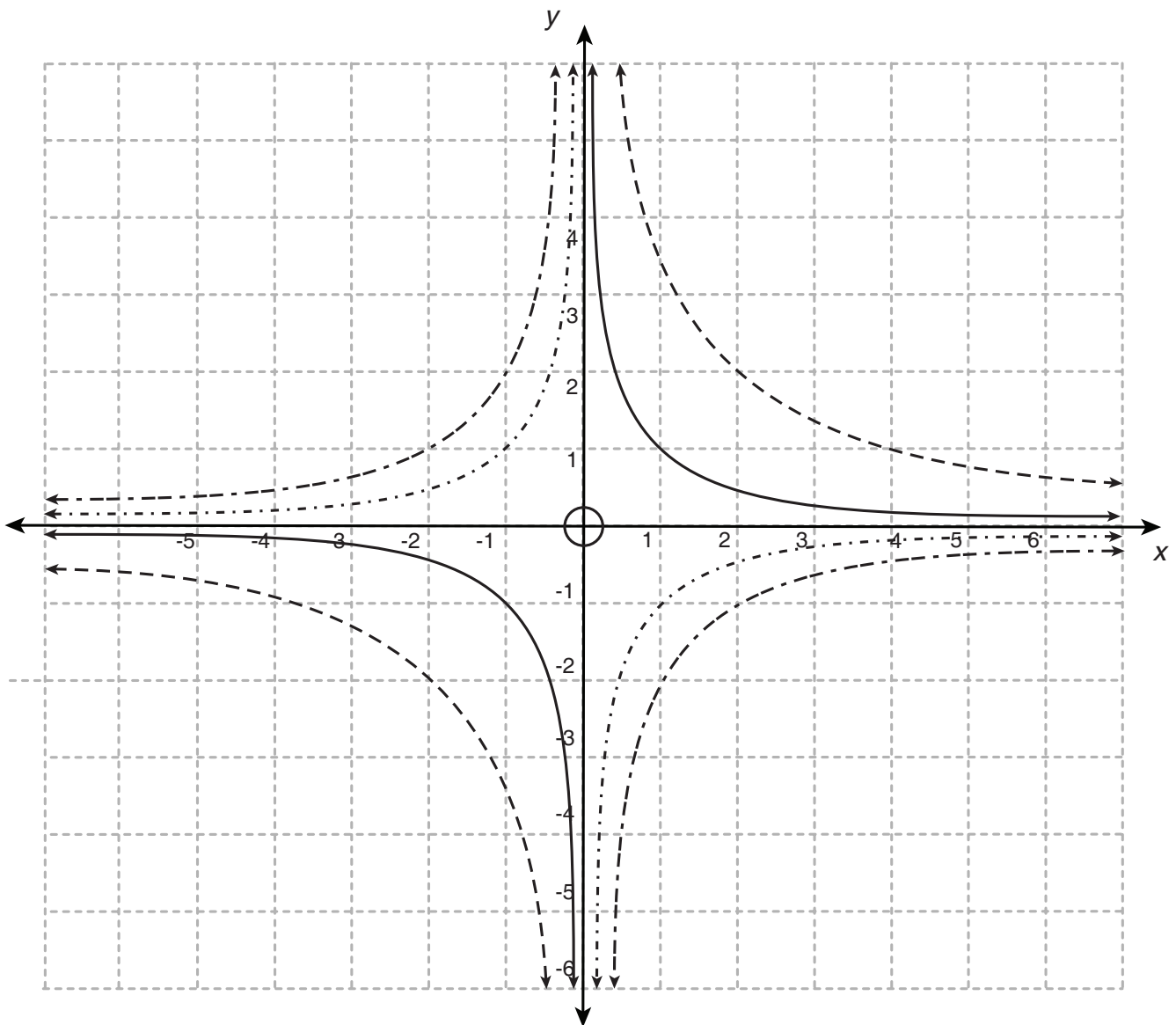
RESOURCE 2

LESSON 4



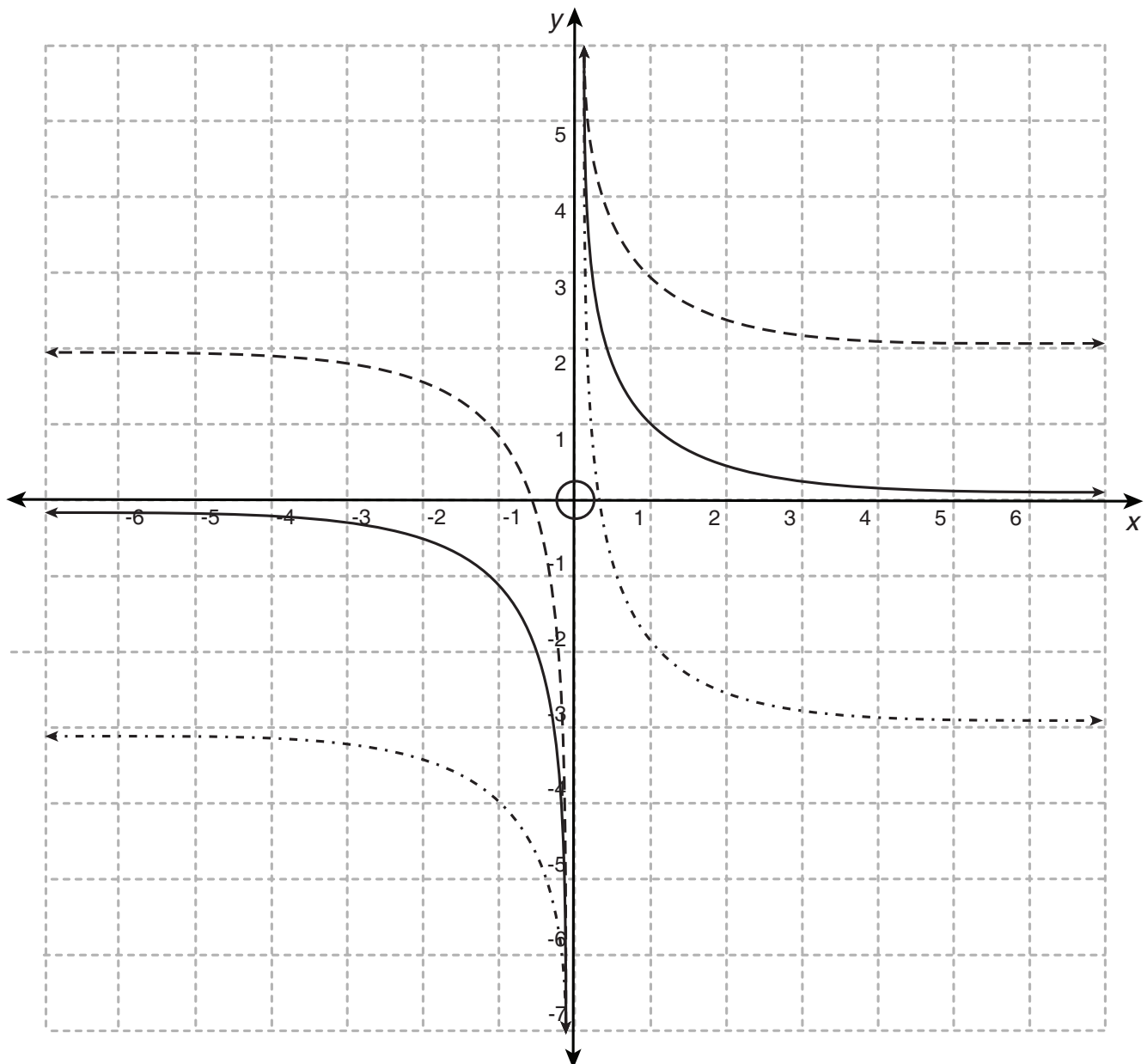
RESOURCE 3

LESSON 5



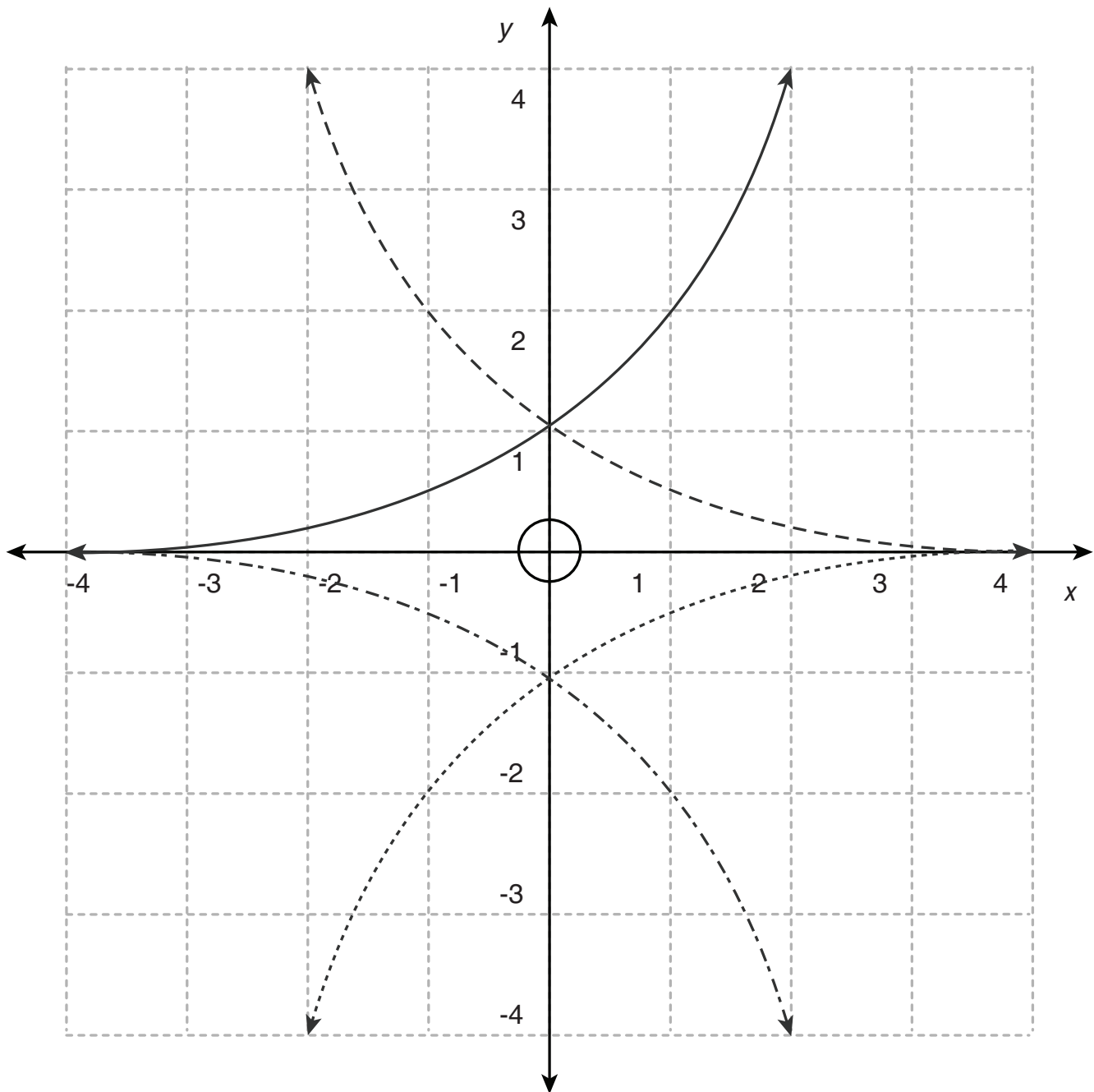
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LESSON 5



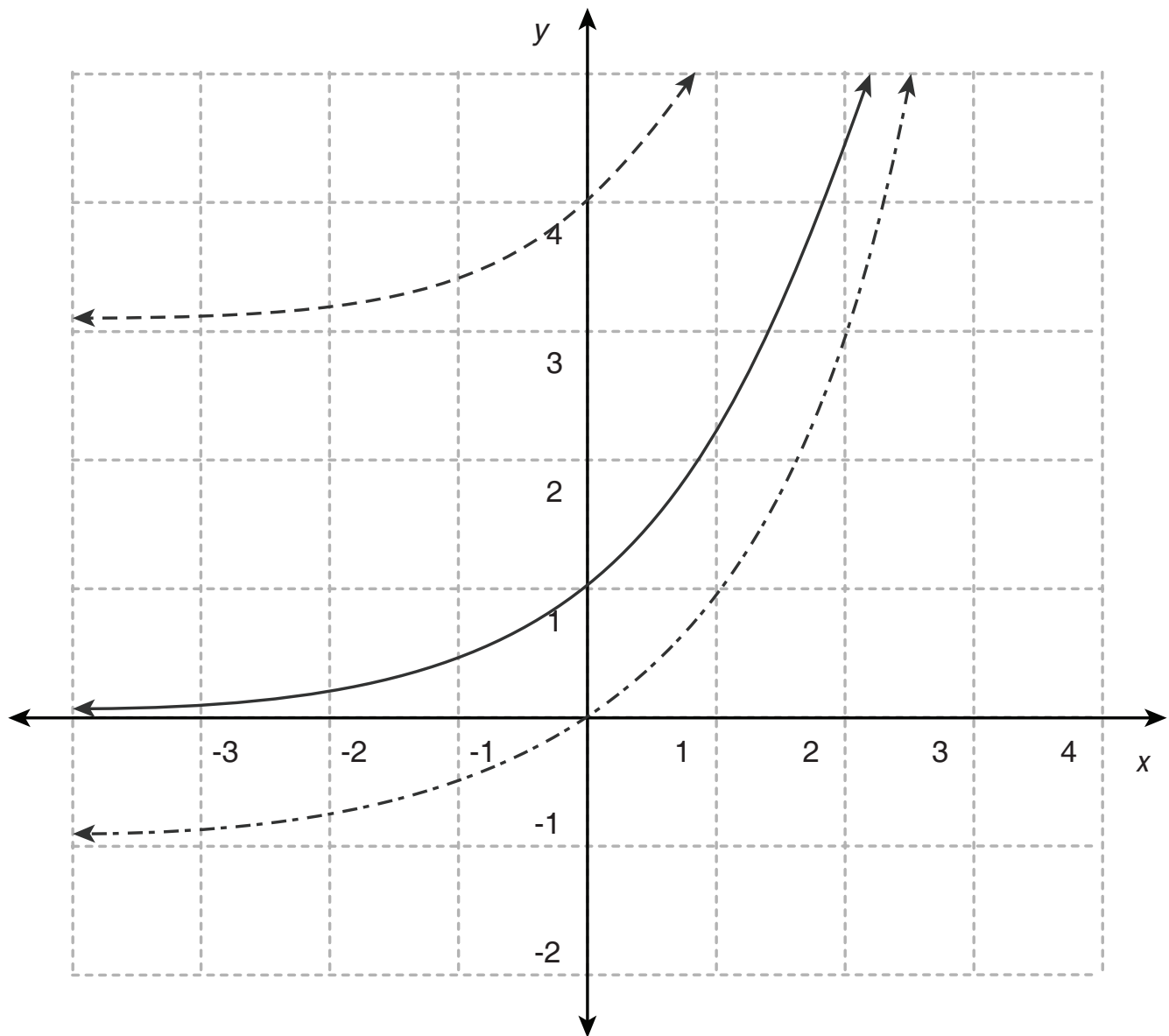
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LESSON 6



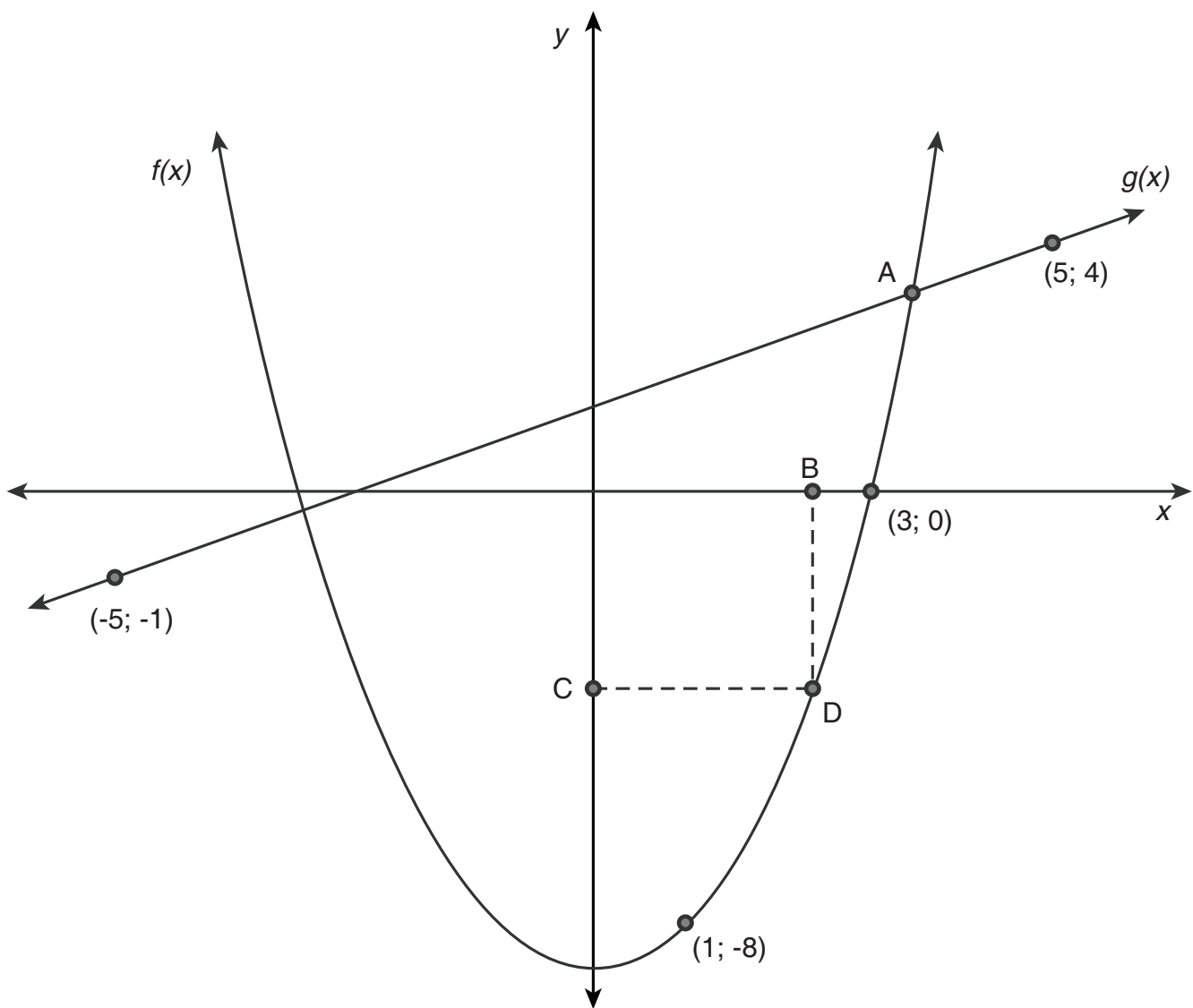
RESOURCE 6

LESSON 6



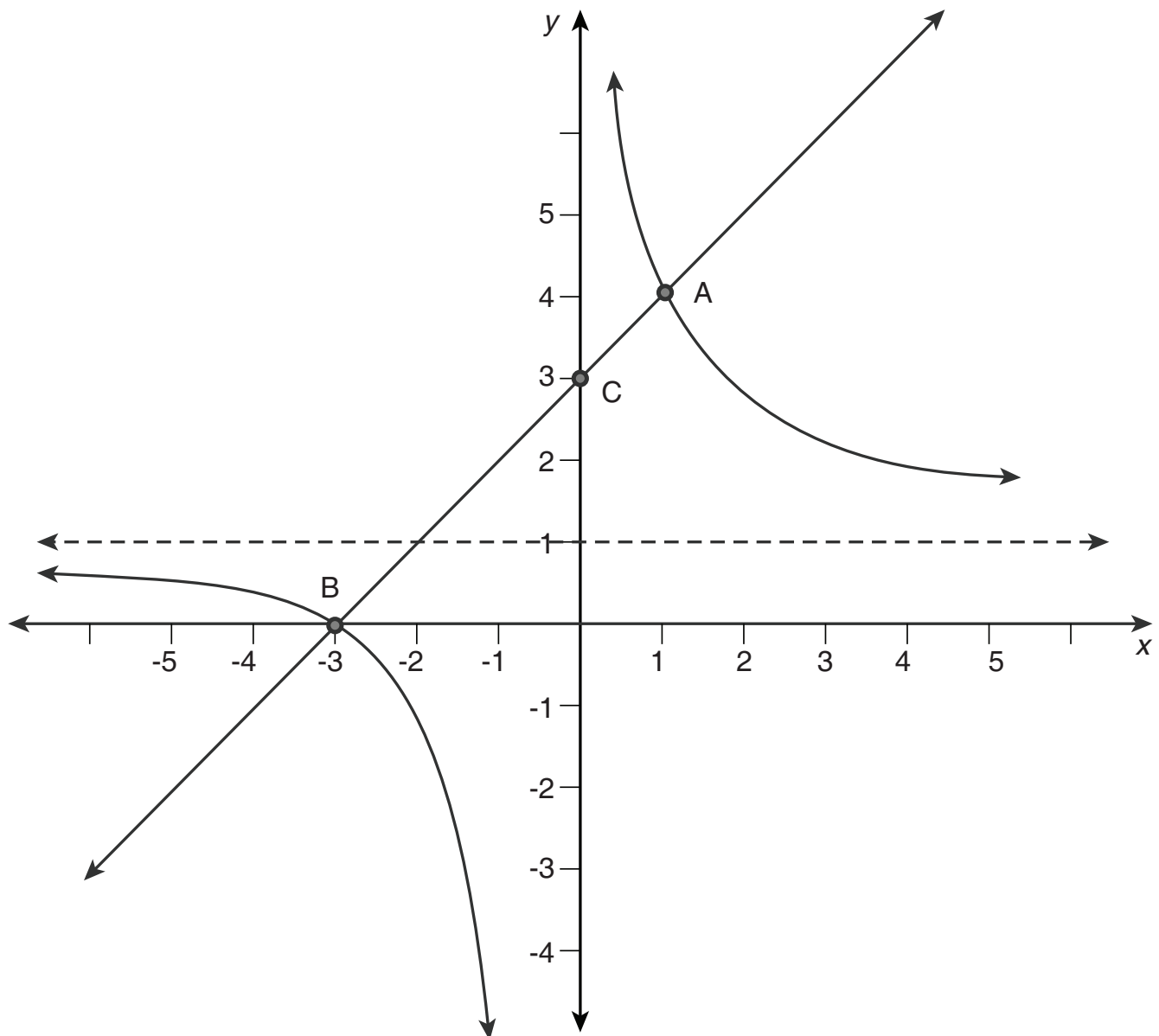
RESOURCE 7

LESSON 8



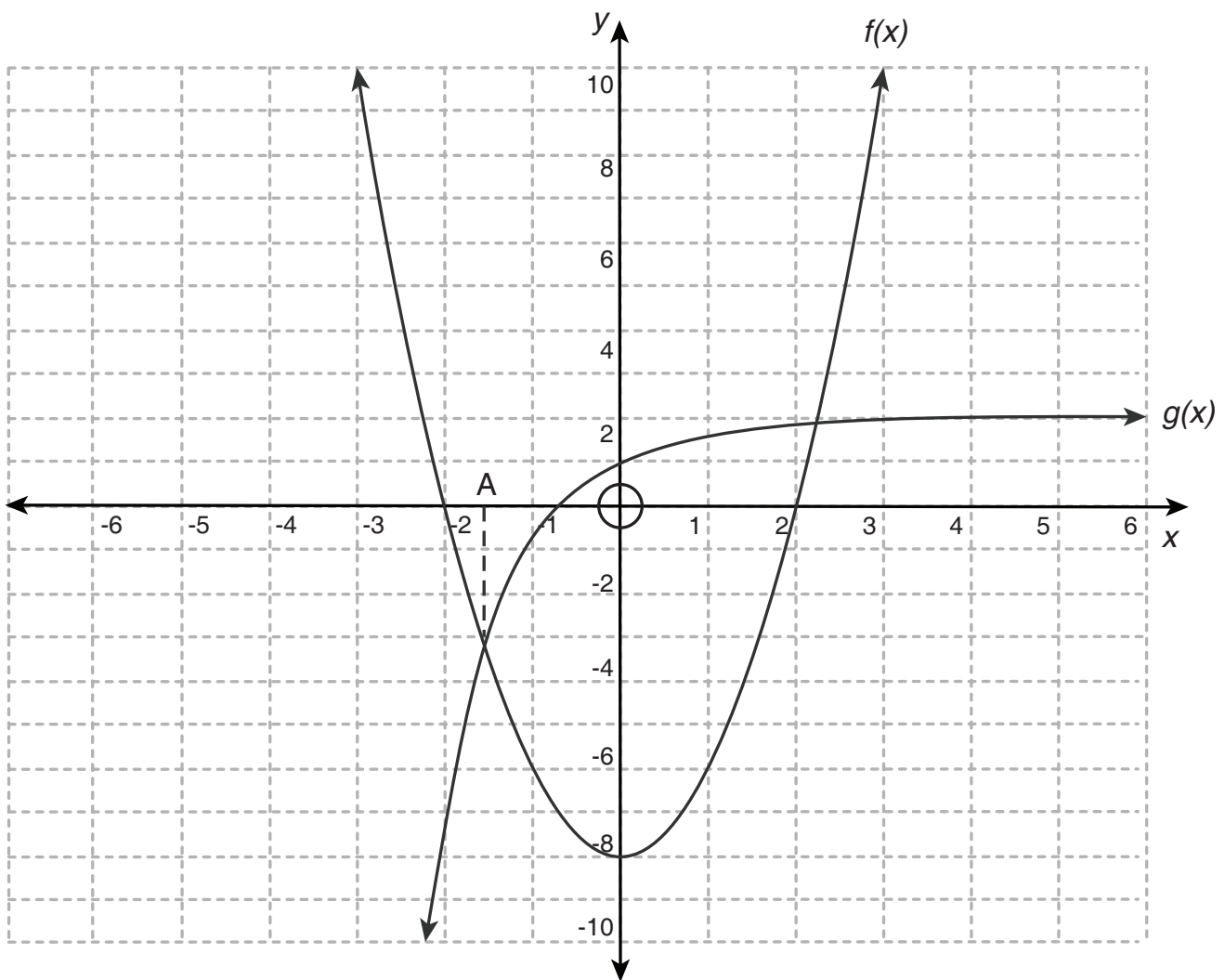
RESOURCE 8

LESSON 8



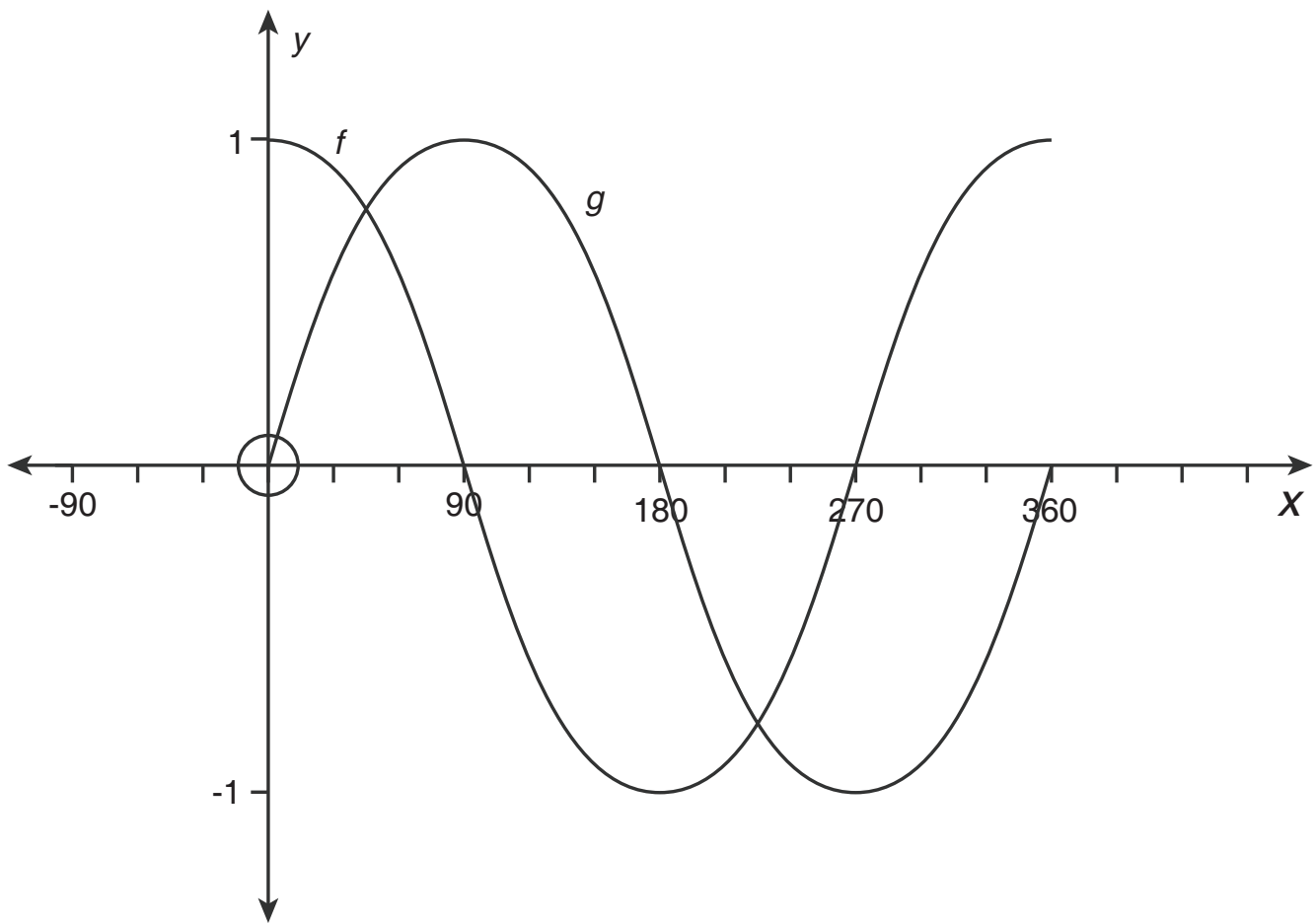
RESOURCE 9

LESSON 8



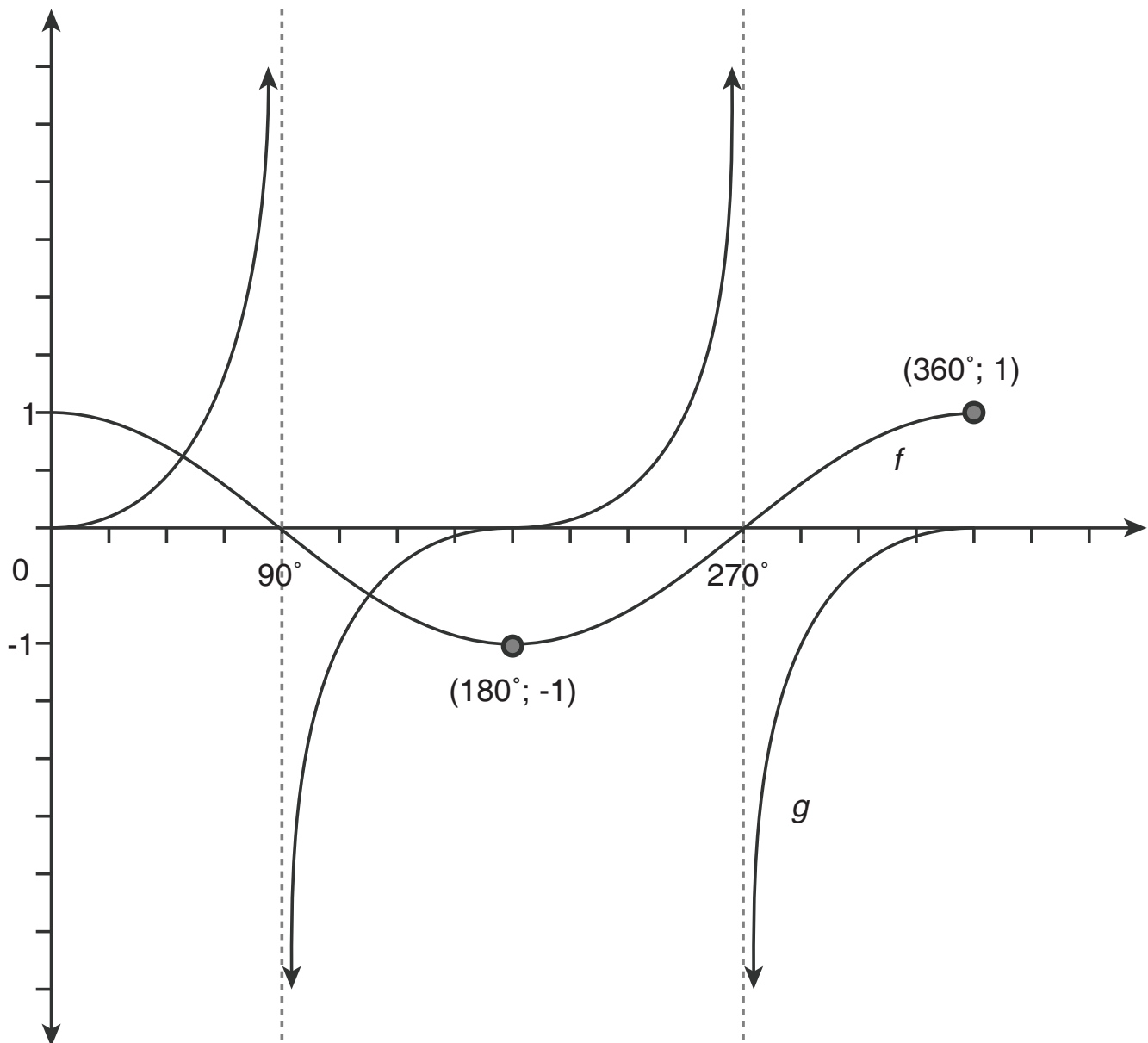
RESOURCE 10

LESSON 12



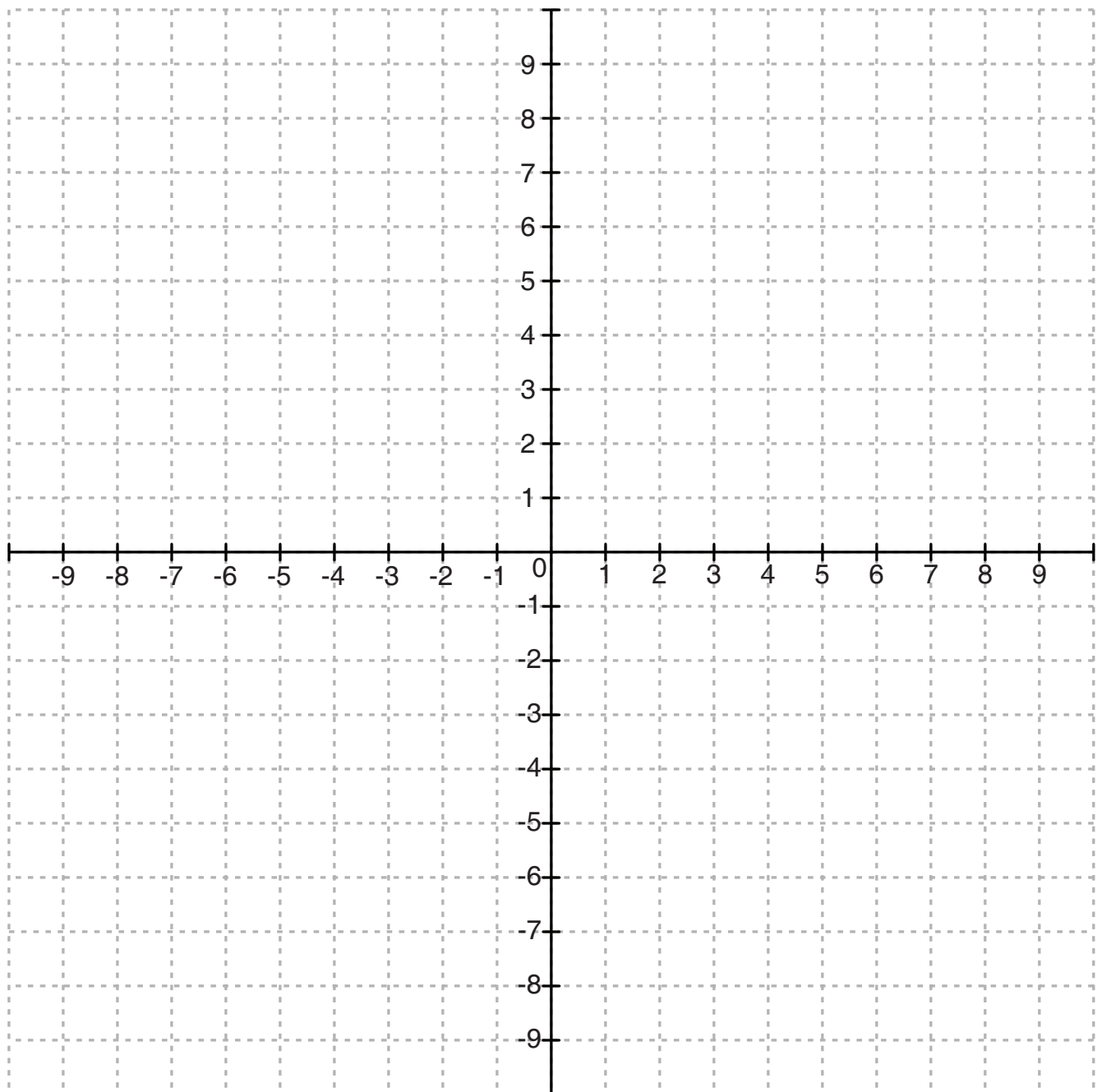
RESOURCE 11

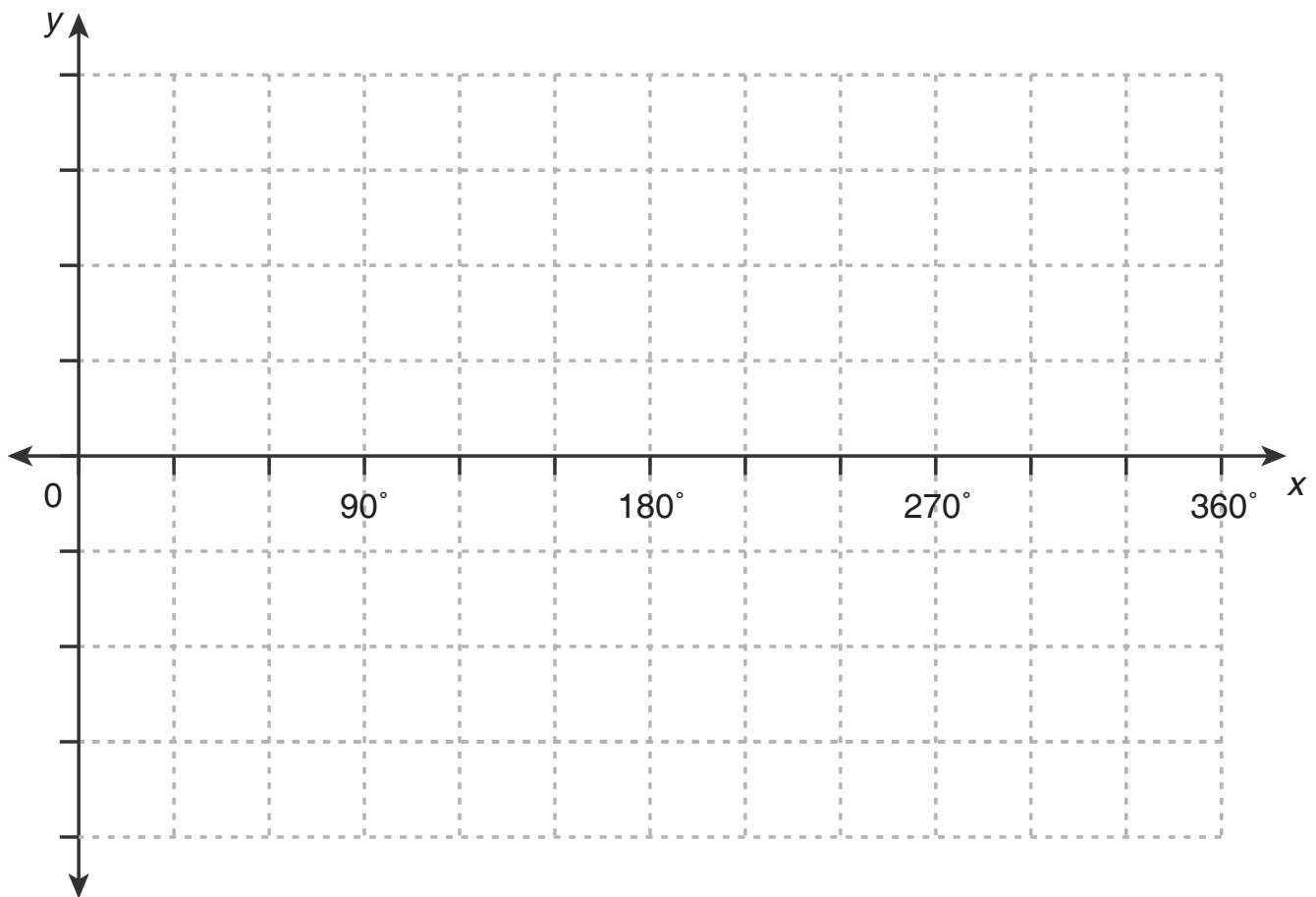
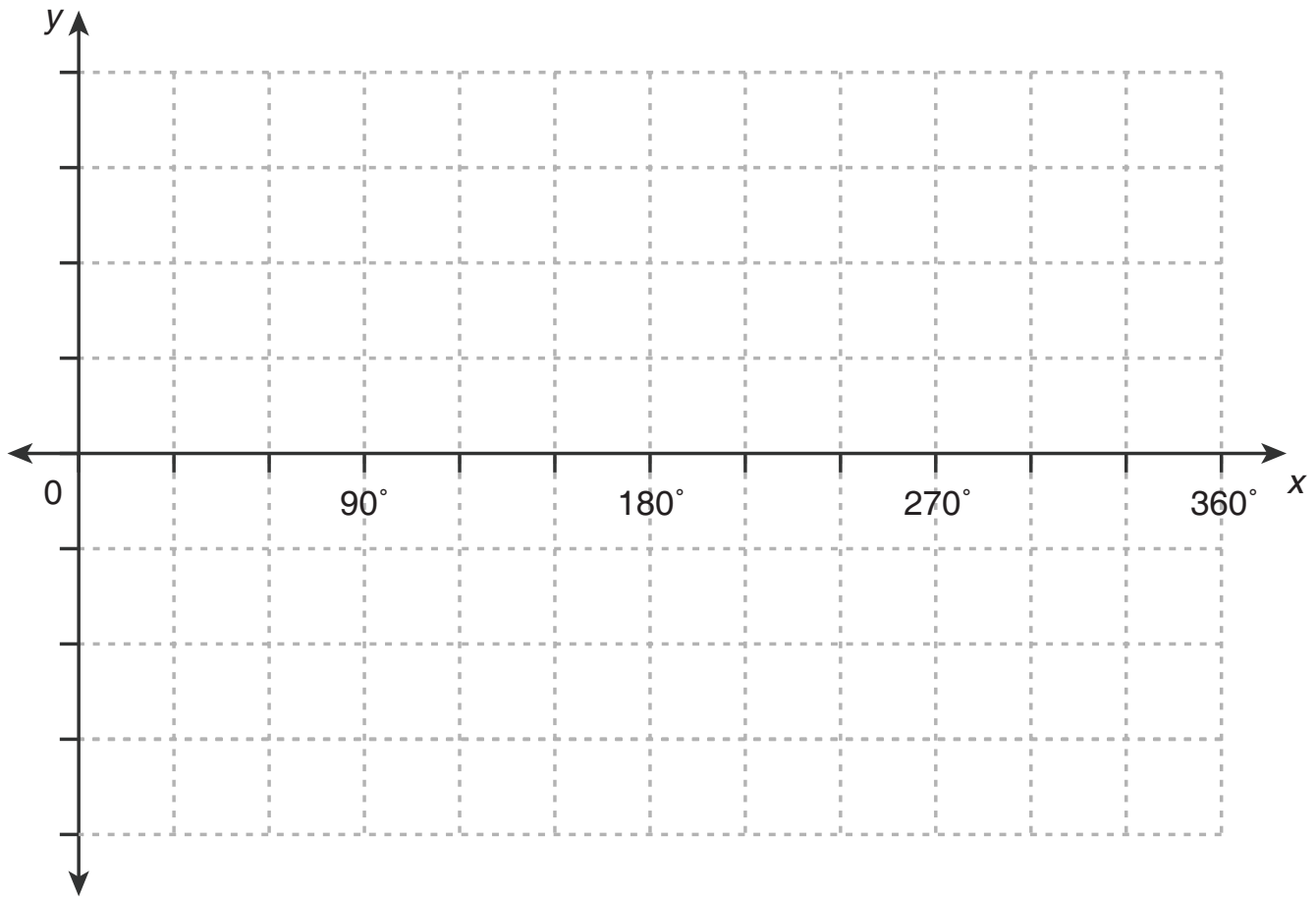
LESSON 12



RESOURCE 13

CARTESIAN PLANE TEMPLATE



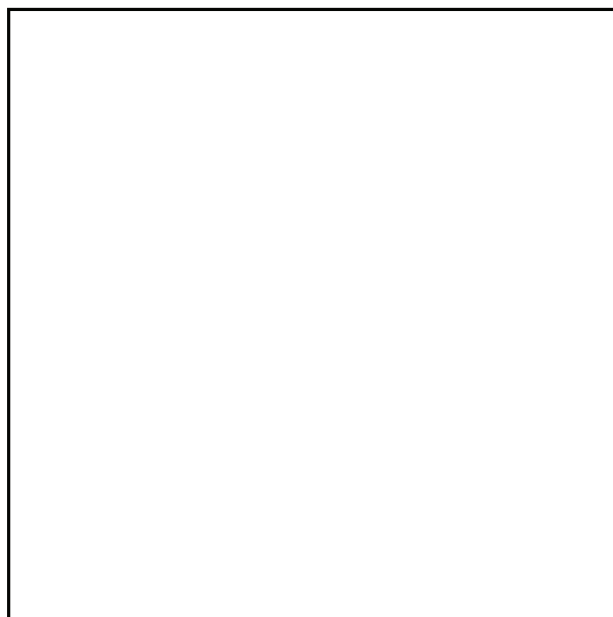


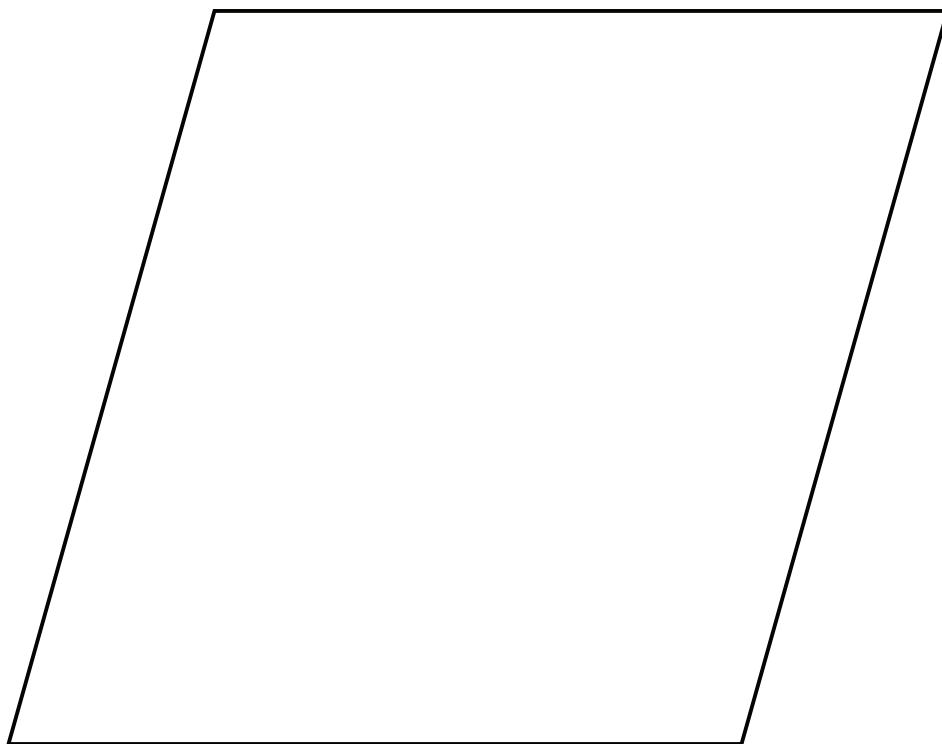
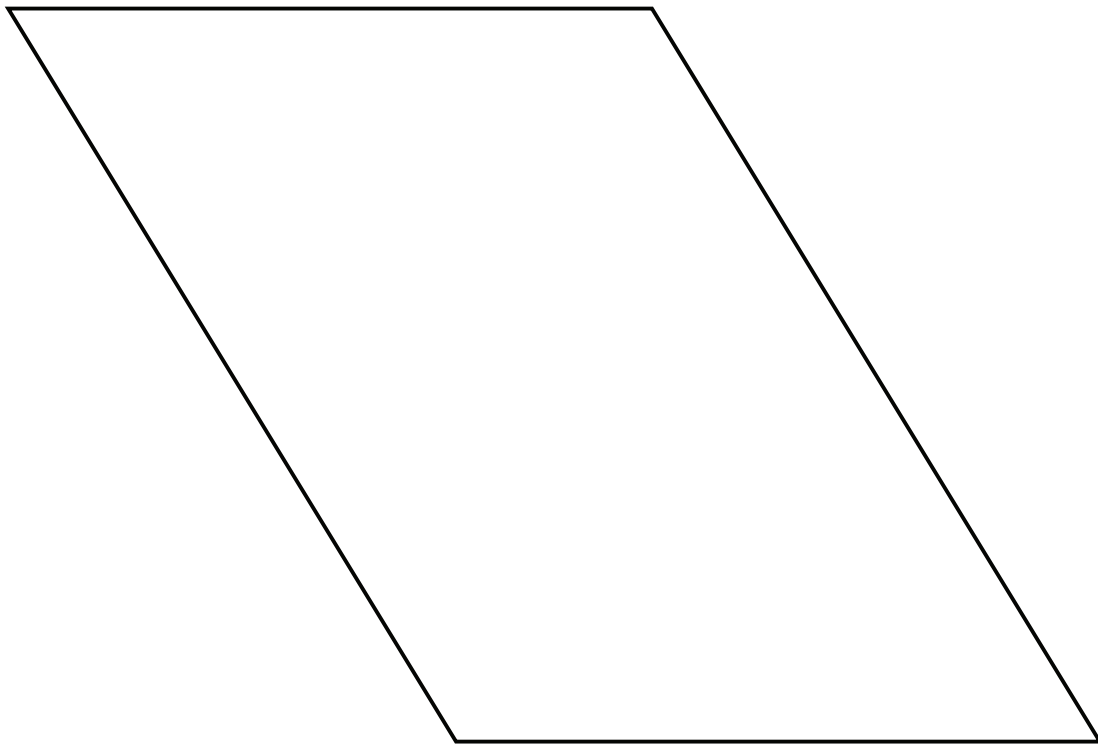
EUCLIDEAN GEOMETRY

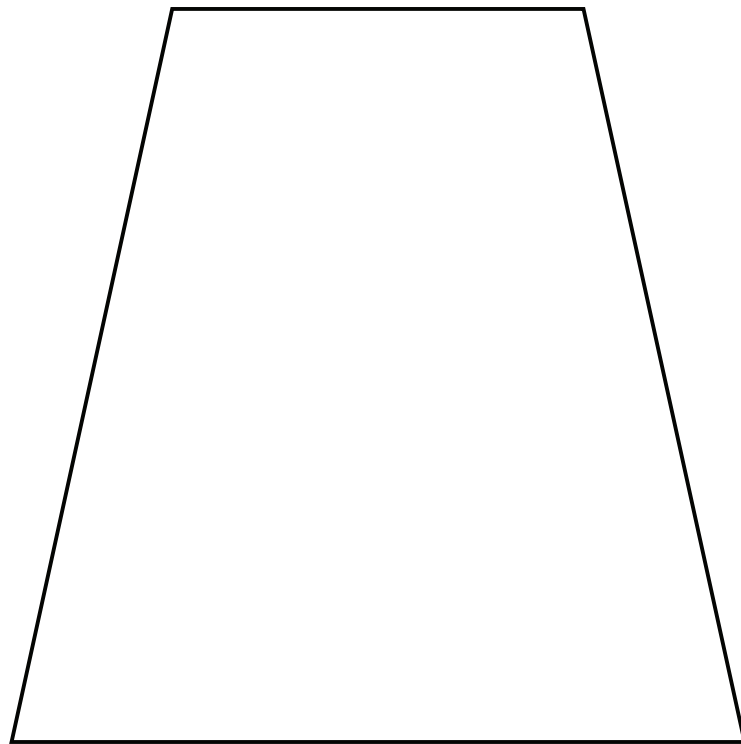
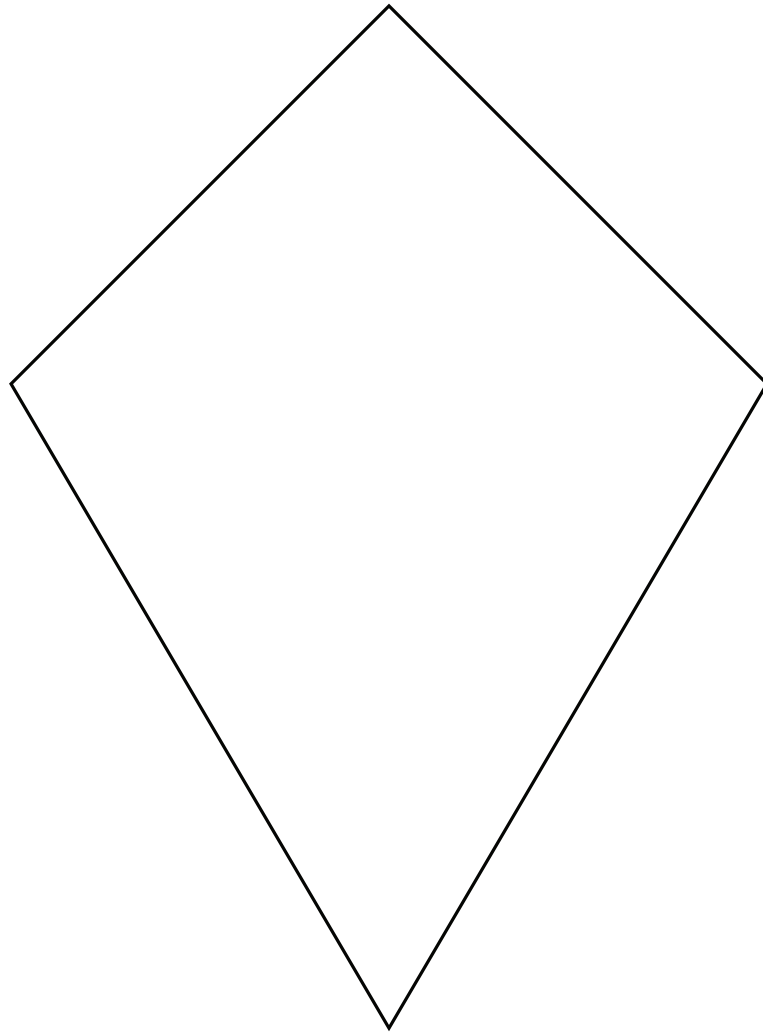
RESOURCE 14

LESSON 3

PROPERTIES OF QUADRILATERALS – GROUP WORK







RESOURCE 15

PROPERTIES OF QUADRILATERALS

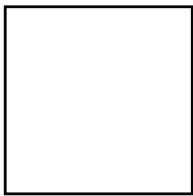

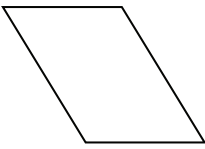
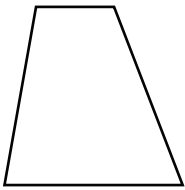
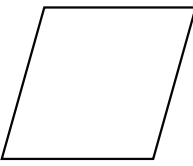
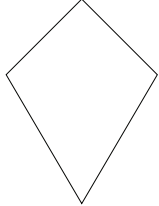
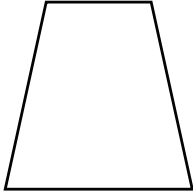
	Diagram	Angle Property (1)	Side Property (2)	Parallel Sides (3)	Diagonals (4)
SQUARE					
RECTANGLE					
PARALLELOGRAM					
TRAPEZIUM					
RHOMBUS					
KITE					
ISOSCELES TRAPEZIUM					

GRADE 10, TERM 2: RESOURCE PACK

(1) Angle property	(2) Side property	(3) Parallel sides	(4) Diagonals
All four angles are 90°	All sides are the same length	Opposite sides are parallel	Equal lengths. Bisect at 90°
Opposite angles are equal	Opposite sides are the same length	Opposite sides are parallel	Equal lengths. Bisect, not at 90°
Opposite angles are equal	Opposite sides are the same length	Opposite sides are parallel	Not equal lengths. Bisect, not at 90°
The angles can all be different	They can all be different	One pair of opposite sides are parallel	Not equal. Do not bisect
Opposite angles are equal	All sides are the same length	Opposite sides are parallel	Not equal. Bisect at 90°
One pair of opposite angles are equal	Two pairs of adjacent sides are equal	No sides are parallel	One diagonal bisected at 90°
Two pairs of adjacent angles are equal	One pair of opposite sides are equal	One pair of opposite sides are parallel	Equal length. Do not bisect.

RESOURCE 16

MEMORANDUM/SUMMARY

	Diagram	Angle Property (1)	Side Property (2)	Parallel Sides (3)	Diagonals (4)
SQUARE		All four are 90°	All sides are the same length	Opposite sides are parallel	Equal lengths. Bisect at 90°
RECTANGLE		Opposite angles are equal	Opposite sides are the same length	Opposite sides are parallel	Equal lengths. Bisect, not at 90°
PARALLELOGRAM		Opposite angles are equal	Opposite sides are the same length	Opposite sides are parallel	Not equal lengths. Bisect, not at 90°
TRAPEZIUM		They can all be different	They can all be different	One pair of opposite sides are parallel	Not equal. Do not bisect
RHOMBUS		Opposite angles are equal	All sides are the same length	Opposite sides are parallel	Not equal. Bisect at 90°
KITE		One pair of opposite angles are equal	Two pairs of adjacent sides are equal	No sides are parallel	One diagonal bisected at 90°
ISOSCELES TRAPEZIUM		Two pairs of adjacent angles are equal	One pair of opposite sides are equal	One pair of opposite sides are parallel	Equal length. Do not bisect.

MATHEMATICS

ASSESSMENTS
GRADE 10 TERM 2



GRADE 10 ASSESSMENT: MID-YEAR EXAMINATION

GRADE 10 MID-YEAR EXAMINATION

Time: 2 hours

Total: 100 marks

NOTES TO TEACHER

The mid-year examination:

- consists of one paper
- is out of 100 marks
- carries a weighting of 30% of the promotion mark

Prepare for the examination by doing the following:

1. Print one copy of the examination for each learner.
2. As learners do not answer on the question paper, ensure that you have paper for learners to answer on.
3. Remind learners to write their name on each sheet of paper.
4. Make sure that each learner has a pen, pencil, ruler and approved scientific calculator.
5. Read through the instructions and information with the learners once you have handed out the question papers.
6. Remind learners that they have 2 hours to answer the examination.
7. At the end of the examination, collect answer sheets and count them before dismissing learners.

GR 10 MATHEMATICS EXAM (MID-YEAR)

Time: 2 hours

QUESTION	DESCRIPTION	MAXIMUM MARK	ACTUAL MARK
1	Algebra	20	
2	Number Patterns	10	
3	Functions	20	
4	Trigonometry	29	
5	Euclidean Geometry	21	
	TOTAL	100	

INSTRUCTIONS AND INFORMATION

1. This question paper consists of 8 pages.
2. Answer ALL the questions.
3. Clearly show ALL calculations, diagrams, graphs or other work that you have used in determining your answers.
4. If you provide answers only you will NOT necessarily be awarded full marks.
5. You may use an approved scientific calculator (non-programmable and non-graphical), unless otherwise stated.
6. If necessary, round answers off to TWO decimal places, unless stated otherwise.
7. Diagrams are NOT necessarily drawn to scale.
8. Number the answers correctly according to the numbering system used in this question paper.
9. Write neatly and legibly.

QUESTION 1

20 MARKS

1.1 State whether the following numbers are rational, irrational, or non-real.

1.1.1 π (1)

1.1.2 $\frac{22}{7}$ (1)

1.1.3 $\sqrt{-4}$ (1)

1.2 Solve for x :

1.2.1 $x^2 + 5x - 6 = 0$ (3)

1.2.2 $x^3 = 4x$ (4)

1.2.3 $4 - x < 2x - 5$ (3)

1.3 Write the following inequalities in interval notation:

1.3.1 $x \geq 6$ (1)

1.3.2 $-2 < x \leq 5$ (1)

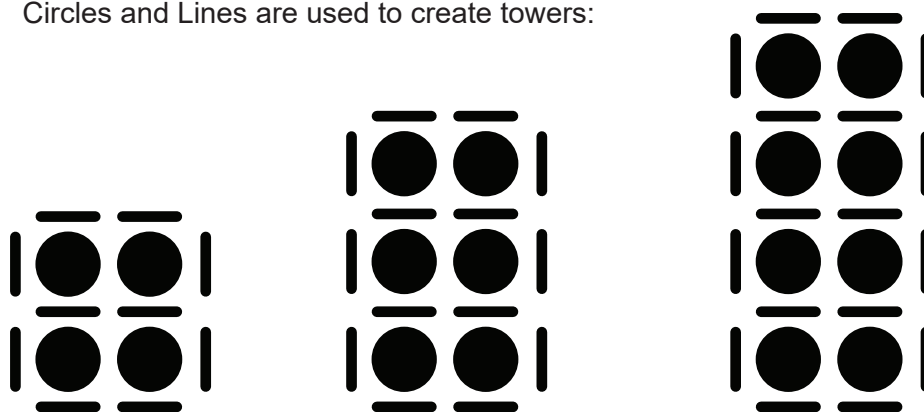
1.4 Simplify the following expression:

1.4.1 $\frac{x^2 - 4x + 4}{x^3 - 8} \times \frac{2x^2 + 4x + 8}{2}$ (5)

QUESTION 2

10 MARKS

2.1 Circles and Lines are used to create towers:



Tower 1

Tower 2

Tower 3

2.1.1 How many Lines will Tower 4 have? (1)

2.1.2 Determine the general term (T_n) for the number of lines in each pattern: (2)

2.1.3 Which Tower will have 138 Lines? (2)

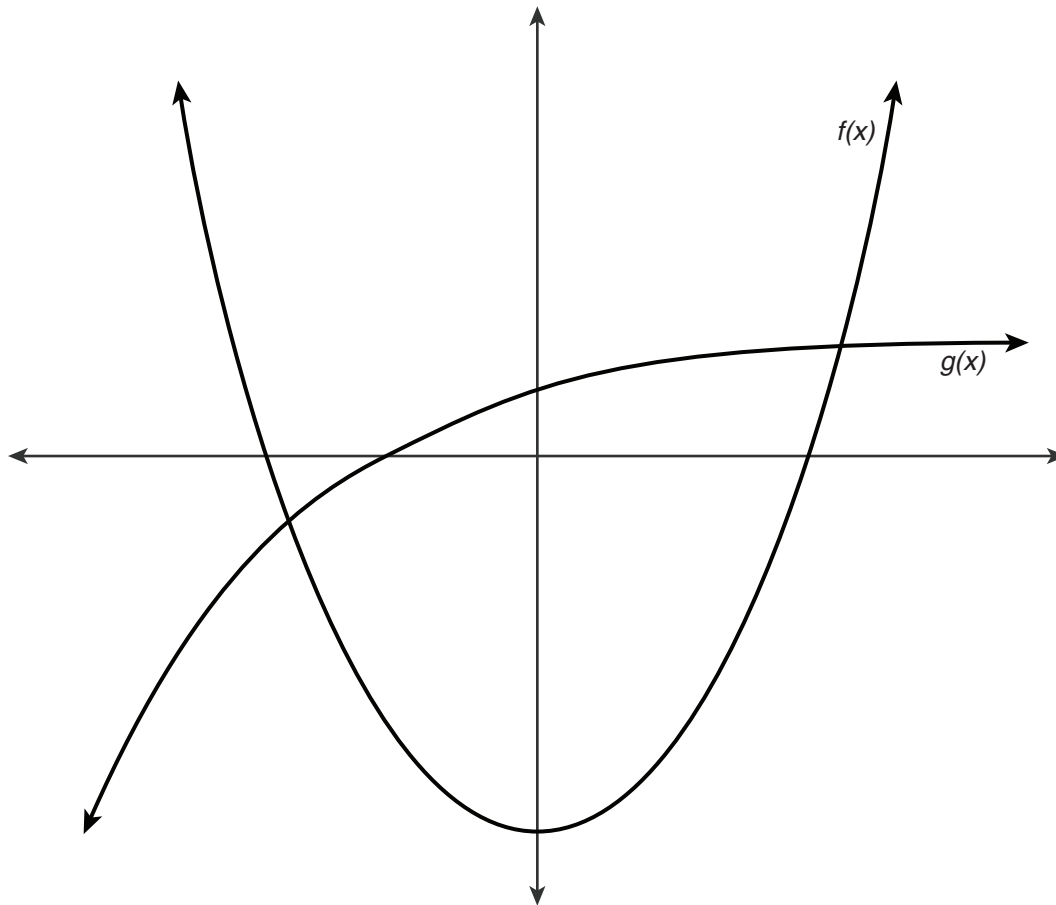
2.1.4 How many Circles will Tower 800 have? (2)

2.2 If the pattern: $-1; 1; -1; 2; -2; 2; -1; 1; -1; 2; -2; 2; \dots$ is continued in this way, what will the 100th number be? (3)

QUESTION 3

20 MARKS

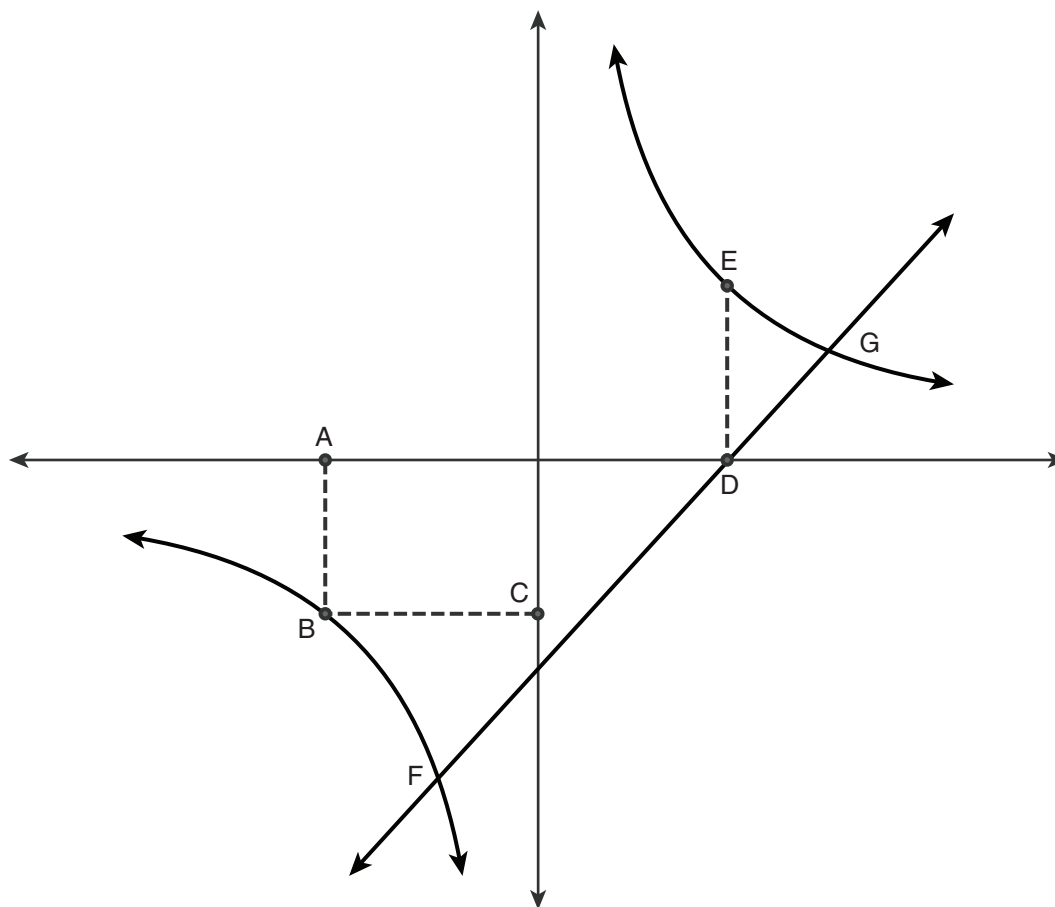
3.1 The functions and are sketched below:



- 3.1.1 Determine the x intercepts of $f(x)$. (3)
- 3.1.2 Determine the y intercepts of $g(x)$. (2)
- 3.1.3 Determine the equation of the asymptote for $g(x)$. (2)
- 3.1.4 Determine the Domain and Range of $f(x)$. (2)

GRADE 10 ASSESSMENT: MID-YEAR EXAMINATION

3.2 The functions $f(x) = x - 2$ and $g(x) = \frac{3}{x}$ are sketched below:



- 3.2.1 Determine the coordinates of F and G, the points of intersection between $f(x)$ and $g(x)$. (5)
- 3.2.2 If the length of AB is 1 unit, what is the length of BC? (2)
- 3.2.3 Determine the length of DE. (2)
- 3.2.4 Determine for which values of x will $f(x) > g(x)$. (2)

QUESTION 4

29 MARKS

4.1 Given $\alpha = 41^\circ$ and $\beta = 49^\circ$, determine the value of:

- 4.1.1 $\cos(\alpha + \beta)$ (1)
- 4.1.2 $3 \tan^2 \beta$ (1)
- 4.1.3 $\frac{\sin 2\alpha}{2 \sin \alpha}$ (1)

GRADE 10 ASSESSMENT: MID-YEAR EXAMINATION

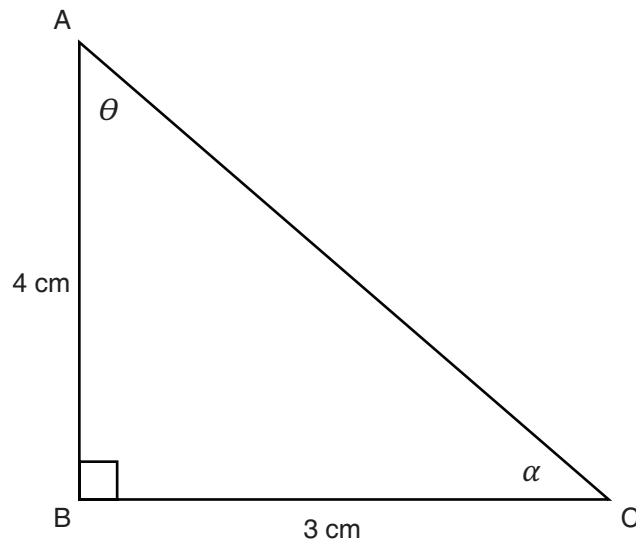
4.2 **WITHOUT using a calculator**, determine the value of:

4.2.1 $\frac{\tan 45^\circ}{\sin 30^\circ}$ (3)

4.2.2 $\cos 45^\circ \times \sin 45^\circ$ (3)

4.2.3 $\frac{\sin 60^\circ \cdot \tan 60^\circ}{\tan 0^\circ + \cos 60^\circ}$ (4)

4.3 Using the diagram below determine the value of:



4.3.1 The length of AC (1)

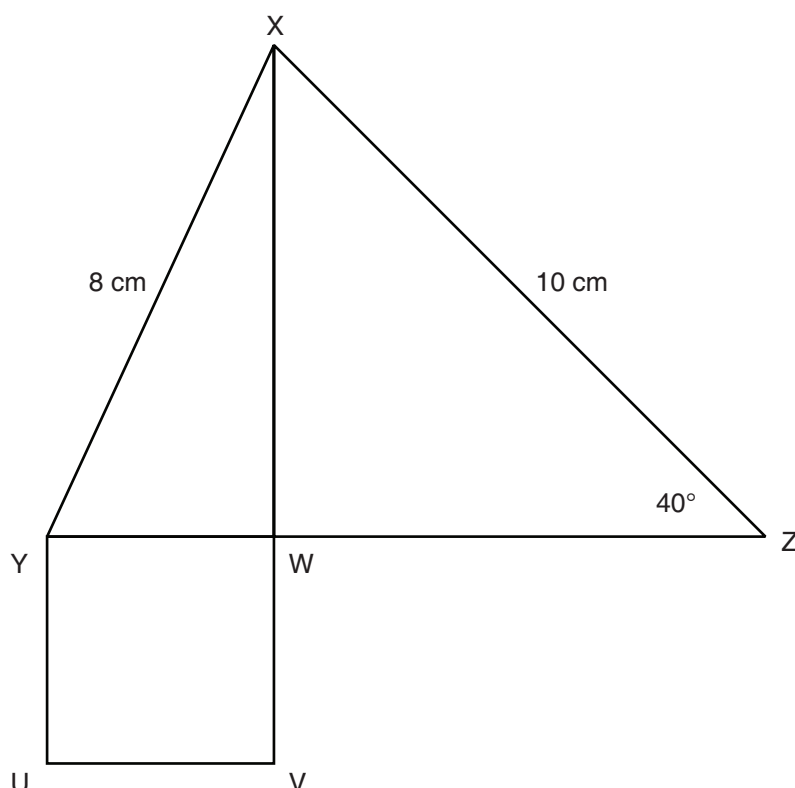
4.3.2 $\tan \theta$ (1)

4.3.3 $\sin \alpha$ (1)

4.3.4 $\operatorname{cosec} \theta$ (1)

4.3.5 θ (2)

4.4 In the diagram below, YWVU is a square.



4.4.1 Determine the value of length UV. (6)

4.5 Consider the functions $f(x) = \cos x$ and $h(x) = -3 \cos x$

4.5.1 Determine $f(0)$. (1)

4.5.2 What is the amplitude of $f(x)$? (1)

4.5.3 What is the amplitude of $h(x)$? (1)

4.5.4 If the graph of $h(x)$ is shifted 5 units upwards, write down the new function for $h(x)$. (1)

QUESTION 5

21 MARKS

5.1 Complete the following:

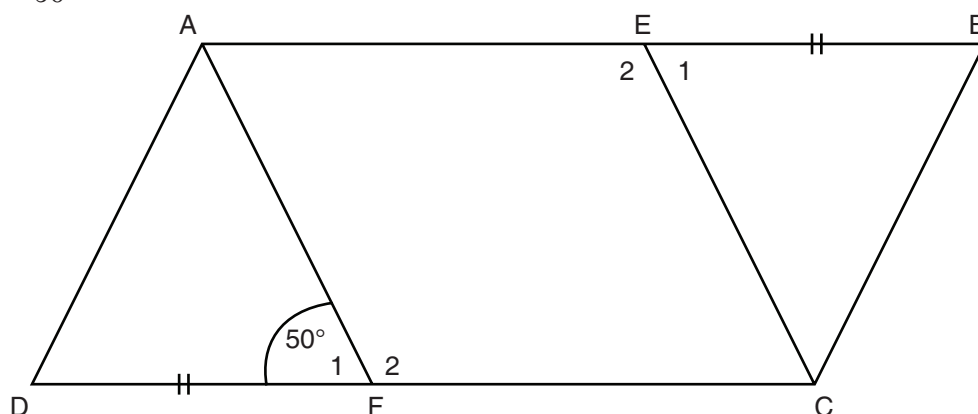
5.1.1 List two ways to prove a quadrilateral is a parallelogram. (2)

5.1.2 Midpoint Theorem: The line segment connecting the _____ of two sides of a _____ is _____ to the third side and is congruent to one _____ of the third side (4)

GRADE 10 ASSESSMENT: MID-YEAR EXAMINATION

5.2 In the diagram below:

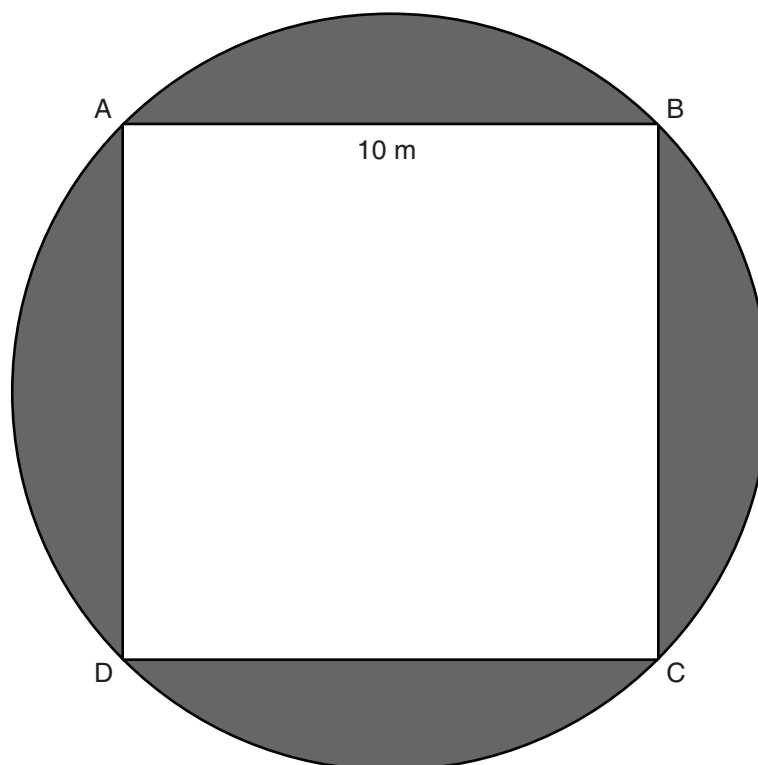
- AECF is a parallelogram
- $DF = EB$
- $\hat{F}_1 = 50^\circ$



5.2.1 Prove, with reasons, that $\triangle ADF \equiv \triangle CBE$ (6)

5.2.2 Prove, with reasons, that ABCD is a parallelogram. (3)

5.3 In the diagram below, quadrilateral ABCD is inscribed in a circle. Side AB has a length of 10m.



5.3.1 If the area of the shaded region is 60 m^2 , prove that quadrilateral ABCD is NOT a square. (Hint: Area of Circle $\text{Area of Circle} = \pi r^2$) (6)

GR 10 MATHEMATICS EXAM (MID-YEAR) MEMO

QUESTION	DESCRIPTION	MAXIMUM MARK	ACTUAL MARK
1	Algebra	20	
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	TOTAL	100	

QUESTION 1

20 MARKS

1.1 State whether the following numbers are rational, irrational, or non-real.

1.1.1 π irrational ✓ (1K)

1.1.2 $\frac{22}{7}$ rational ✓ (1K)

1.1.3 $\sqrt{-4}$ non-real ✓ (1K)

1.2 Solve for x :

1.2.1 $x^2 + 5x - 6 = 0$ (3R)

$$(x + 6) \checkmark (x - 1) \checkmark = 0$$

$$x = -6 \text{ or } x = 1 \checkmark$$

1.2.2 $x^3 = 4x$ (4R)

$$x^3 - 4x = 0 \checkmark$$

$$x(x^2 - 4) = 0 \checkmark$$

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

$$x = 0 \text{ or } x = 2 \text{ or } x = -2 \checkmark$$

1.2.3 $4 - x < 2x - 5$ (3R)

$$-3x < -9 \checkmark$$

$$3x > 9 \checkmark$$

$$x > 3 \checkmark$$

GRADE 10 ASSESSMENT: MID-YEAR EXAMINATION

1.3 Write the following inequalities in interval notation:

1.3.1 $x \geq 6$ $x \in [6; \infty)$ ✓ (1K)

1.3.2 $-2 < x \leq 5$ $x \in (-2; 5]$ ✓ (1K)

1.4 Simplify the following expression:

1.4.1 $\frac{x^2 - 4x + 4}{x^3 - 8} \times \frac{2x^2 + 4x + 8}{2}$ (5R)

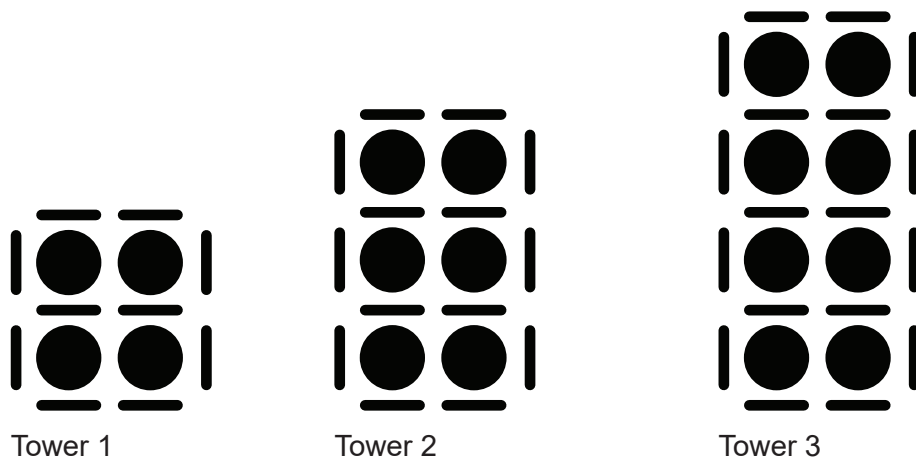
$$= \frac{(x-2)(x-2) \checkmark}{(x-2)(x^2+2x+4) \checkmark} \times \frac{2(x^2+2x+4) \checkmark}{2}$$

$$= x - 2 \checkmark \checkmark$$

QUESTION 2

10 MARKS

2.1 Circles and lines are used to create towers:



2.1.1 How many Lines will Tower 4 have? 30 ✓ (1C)

2.1.2 Determine the general term (T_n) for the number of Lines in each pattern: (2R)

$$T_n = 6n + 6 \checkmark \checkmark$$

2.1.3 Which Tower will have 138 Lines? (2C)

$$T_n = 6n + 6$$

$$138 = 6n + 6 \checkmark$$

$$132 = 6n$$

$$n = 22 \checkmark$$

2.1.4 How many Circles will Tower 800 have? (2C)

$$T_n = 1602 \checkmark \checkmark$$

GRADE 10 ASSESSMENT: MID-YEAR EXAMINATION

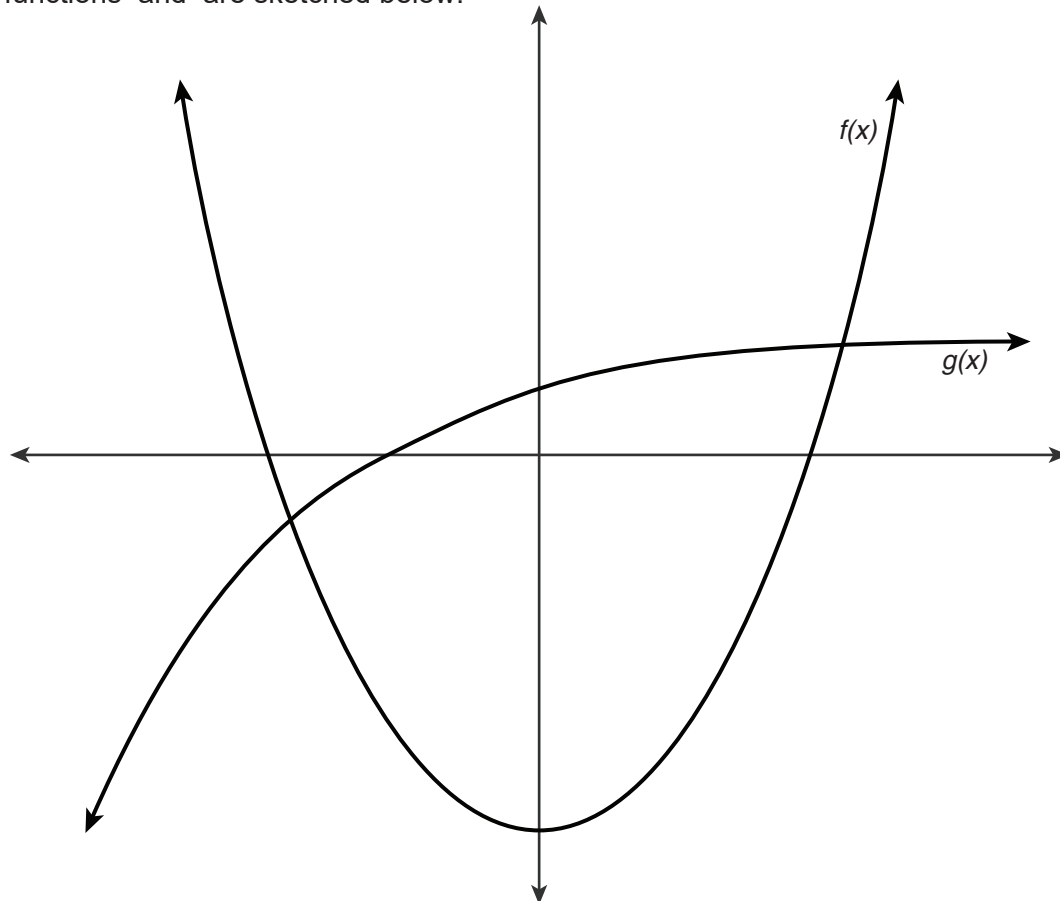
2.2 If the pattern: -1; 1; -1; 2; -2; 2; -1; 1; -1; 2; -2; 2; is continued in this way, what will the 100th number be? (3P)

The 100th number will be 2 ✓✓

QUESTION 3

20 MARKS

3.1 The functions $f(x)$ and $g(x)$ are sketched below:



3.1.1 Determine the x intercepts of $f(x)$. (3R)

$$0 = 2x^2 - 8 \quad \checkmark$$

$$0 = 2(x^2 - 4) \quad \checkmark$$

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

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

3.1.2 Determine the y intercepts of $g(x)$ (2R)

$$g(0) = -\left(\frac{1}{2}\right)^0 + 2 \quad \checkmark$$

$$g(0) = -1 + 2 \quad \checkmark$$

$$g(0) = 1 \quad \checkmark$$

GRADE 10 ASSESSMENT: MID-YEAR EXAMINATION

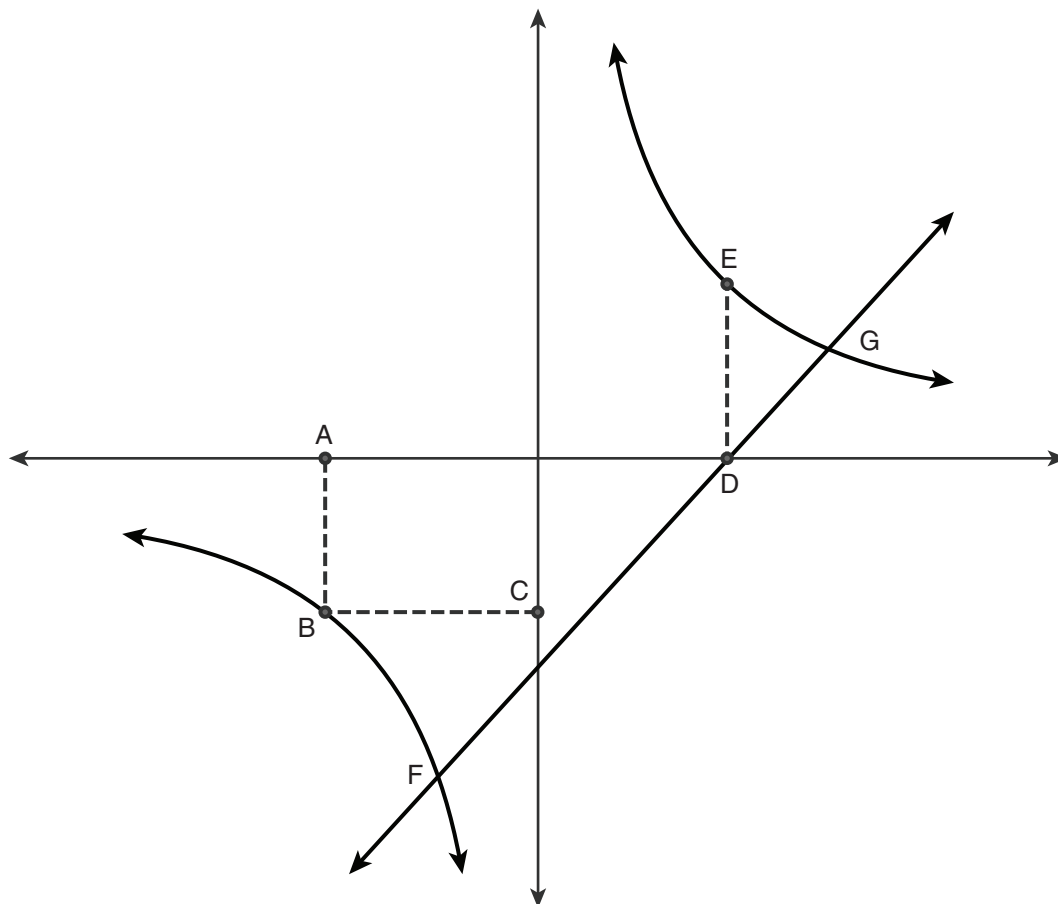
- 3.1.3 Determine the equation of the asymptote for $g(x)$. (2R)

$$y = 2 \checkmark$$

- 3.1.4 Determine the Domain and Range of $f(x)$. (2C)

$$-\infty < x < \infty \text{ and } y \geq -8 \checkmark \checkmark$$

- 3.2 The functions $f(x) = x - 2$ and $g(x) = \frac{3}{x}$ are sketched below:



- 3.2.1 Determine the coordinates of F and G, the points of intersection between $f(x)$ and $g(x)$. (5C)

$$f(x) = g(x)$$

$$x - 2 = \frac{3}{x} \checkmark$$

$$x^2 - 2x - 3 = 0$$

$$(x - 3)(x + 1) = 0 \checkmark$$

$$x = 3 \text{ or } x = -1 \checkmark$$

$$f(3) = 3 - 2 \text{ or } f(-1) = -1 - 2$$

$$f(3) = 1 \text{ or } f(-1) = -3 \checkmark$$

points of intersection are $(3; 1)$ and $(-1; -3) \checkmark$

GRADE 10 ASSESSMENT: MID-YEAR EXAMINATION

3.2.2 If the length of AB is 1 unit, what is the length of BC? (2C)

$$g(x) = \frac{3}{x}$$

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

$$x = 3$$

The length of BC is 3 units \checkmark

3.2.3 Determine the length of DE. (2C)

Coordinate of D is (2;0) \checkmark

$$g(2) = \frac{3}{2} \checkmark$$

The length of DE is $\frac{3}{2}$ units

3.2.4 Determine for which values of x will $f(x) > g(x)$. (2C)

$$-1 < x < 0 \checkmark \text{ and } x > 3 \checkmark$$

QUESTION 4

29 MARKS

4.1 Given $\alpha = 41^\circ$ and $\beta = 49^\circ$, determine the value of:

4.1.1 $\cos(\alpha + \beta) = 0 \checkmark$ (1R)

4.1.2 $3 \tan^2 \beta = 3,97 \checkmark$ (1R)

4.1.3 $\frac{\sin 2\alpha}{2 \sin \alpha} = 0,75 \checkmark$ (1R)

4.2 **WITHOUT using a calculator**, determine the value of:

4.2.1 $\frac{\tan 45^\circ}{\sin 30^\circ}$ (2K+1R)

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

$$= 2 \checkmark$$

4.2.2 $\cos 45^\circ \times \sin 45^\circ$ (2K+1R)

$$= \frac{\sqrt{2}}{2} \checkmark \times \frac{\sqrt{2}}{2} \checkmark$$

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

4.2.3 $\frac{\sin 60^\circ \cdot \tan 60^\circ}{\tan 0^\circ + \cos 60^\circ}$ (2K+2R)

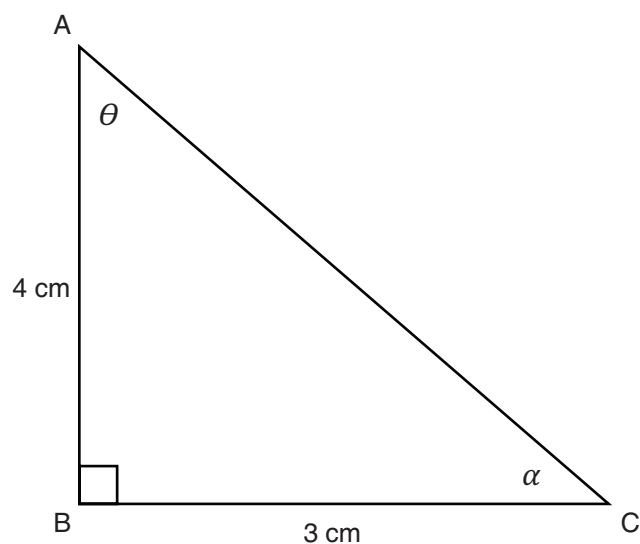
$$= \frac{\frac{\sqrt{3}}{2} \cdot \sqrt{3}}{0 + \frac{1}{2}} \checkmark$$

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

$$= 3 \checkmark$$

GRADE 10 ASSESSMENT: MID-YEAR EXAMINATION

4.3 Using the diagram below determine the value of:



4.3.1 The length of AC (1R)

$$AC = 5 \text{ cm } \checkmark$$

4.3.2 $\tan \theta$ (1R)

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

4.3.3 $\sin \alpha$ (1R)

$$= \frac{4}{5} \checkmark$$

4.3.4 $\operatorname{cosec} \theta$ (1C)

$$= \frac{5}{3} \checkmark$$

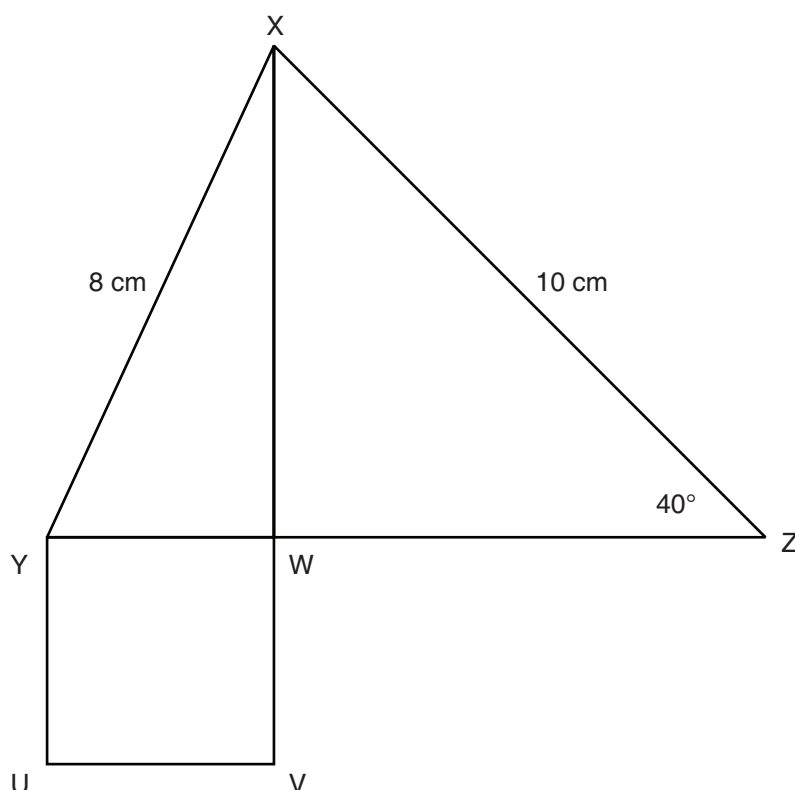
4.3.5 θ (2C)

$$\tan \theta = \frac{3}{4} \checkmark$$

$$\theta = \tan^{-1}\left(\frac{3}{4}\right) = 36,87^\circ \checkmark$$

4.4 In the diagram below, YWVU is a square.

(6P)



4.4.1 Determine the value of length UV.

$$\sin 40 = \frac{XW}{10} \checkmark$$

$$XW = \sin 40^\circ \times 10 = 6,43 \text{ cm} \checkmark$$

$$YW^2 = 8^2 - 6,43^2 \checkmark$$

$$YW^2 = 22,68$$

$$YW = 4,76 \checkmark$$

$$YW = UV \text{ (since YWVU is a square)} \checkmark$$

$$\therefore UV = 4,76 \text{ cm} \checkmark \quad (6)$$

4.5 Consider the functions $f(x) = \cos x$ and $h(x) = -3 \cos x$

4.5.1 Determine $f(0)$. $f(0) = 1 \checkmark$ (1R)

4.5.2 What is the amplitude of $f(x)$? Amplitude = 1 \checkmark (1K)

4.5.3 What is the amplitude of $h(x)$? Amplitude = 3 \checkmark (1K)

4.5.4 If the graph of $h(x)$ is shifted 5 units upwards, write down the new function for $h(x)$. (1K)

$$h(x) = -3 \cos x + 5 \checkmark$$

GRADE 10 ASSESSMENT: MID-YEAR EXAMINATION

QUESTION 5

21 MARKS

5.1 Complete the following:

5.1.1 List two ways to prove a quadrilateral is a parallelogram. (2K)

Two of the following: ✓✓

Prove that two pairs of opposite sides are parallel

Prove that two pairs of opposite sides are equal

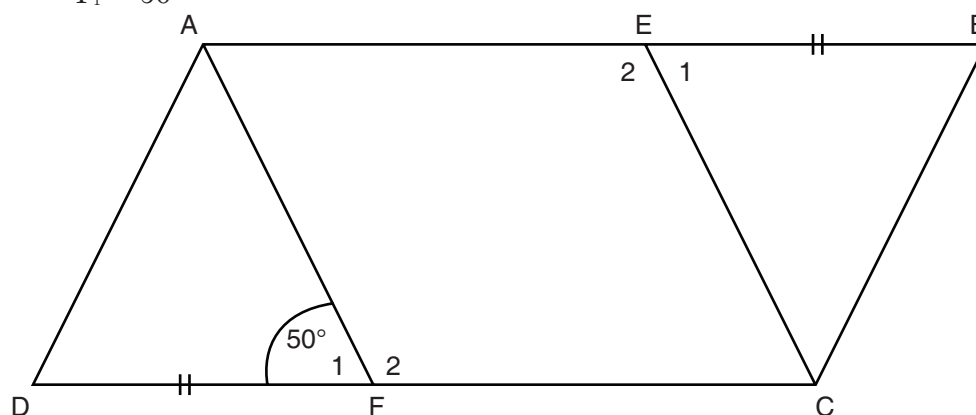
Prove that one pair of opposite sides are equal and parallel

Prove that two pairs of opposite sides are equal

5.1.2 Midpoint Theorem: The line segment connecting the midpoint ✓ of two sides of a triangle ✓ is parallel ✓ to the third side and is congruent to one half ✓ of the third side (4K)

5.2 In the diagram below:

- AECF is a parallelogram
- $DF = EB$
- $\hat{F}_1 = 50^\circ$



5.2.1 Prove, with reasons, that $\triangle ADF = \triangle CBE$ 6C)

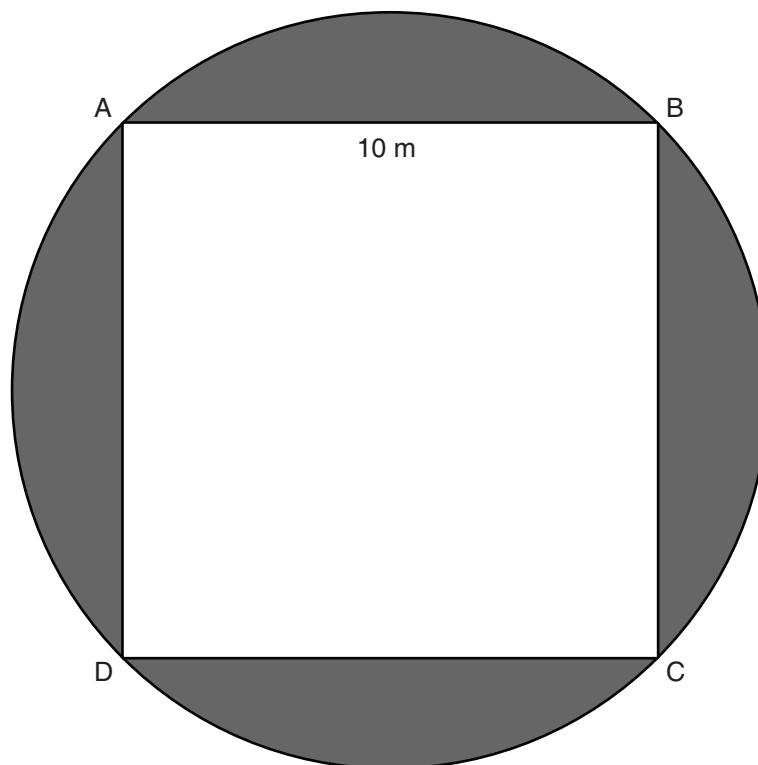
$\hat{F}_1 = 50^\circ$ and AECF is a parm		given
$\hat{F}_2 = 130^\circ$	✓	adj angles on a str. line
$\hat{E}_2 = 130^\circ$	✓	opp. angles of a parm are equal
$\hat{E}_1 = 50^\circ$	✓	adj angles on a str. line
In $\triangle ADF$ and $\triangle CBE$		
$\hat{F}_1 = \hat{E}_1$		proven above
$AF = EC$	✓	opp sides of a parm are equal
$DF = EB$		
$\therefore \triangle ADF = \triangle CBE$	✓	SAS ✓

5.2.2 Prove, with reasons, that ABCD is a parallelogram.

(3C)

$AE = FC$	opp. sides of a parm are equal
$\therefore AB = DC \checkmark$	Since $AE = FC$ and $EB = DF$
$AE \parallel FC$	opp. sides of a parm are parallel
$\therefore AB \parallel DC \checkmark$	Since $AE \parallel FC$ and $AEB; DFC$ are str. lines
$ABCD$ is a parallelogram \checkmark	1 pair of opp sides are equal & parallel

5.3 In the diagram below, quadrilateral ABCD is inscribed in a circle. Side AB has a length of 10m.



GRADE 10 ASSESSMENT: MID-YEAR EXAMINATION

- 5.3.1 If the area of the shaded region is $60m^2$, prove that quadrilateral ABCD is NOT a square. (Hint Area of Circle = πr^2) (6P)

$$\text{Area of ABCD} = 100 \text{ m}^2$$

$$\therefore \text{Area of Circle} = 60 \text{ m}^2 + 100 \text{ m}^2 = 160 \text{ m}^2 \quad \checkmark$$

$$\text{Area of Circle} = \pi r^2$$

$$160 \text{ m}^2 = \pi r^2 \quad \checkmark$$

$$r = \sqrt{\frac{160}{\pi}} = 7,14 \quad \checkmark$$

$$AC = 2 \times 7,14 = 14,28 \quad \checkmark$$

$$AC^2 = AB^2 + BC^2 \text{ (if ABCD is a square)}$$

$$(14,28)^2 = 10^2 + BC^2$$

$$BC = 10,18m \quad \checkmark$$

$$\therefore \text{ABCD is not a square} \quad \checkmark$$

GRADE 10 ASSESSMENT: MID-YEAR EXAMINATION

Question	Knowledge	Routine	Complex	Problem Solve	
1.1.1	1				
1.1.2	1				
1.1.3	1				
1.2.1		3			
1.2.2		4			
1.2.3		3			
1.3.1	1				
1.3.2	1				
1.4.1		5			
2.1.1			1		
2.1.2		2			
2.1.3			2		
2.1.4			2		
2.2				3	
3.1.1		3			
3.1.2		2			
3.1.3		2			
3.1.4			2		
3.2.1			5		
3.2.2			2		
3.2.3			2		
3.2.4			2		
4.1.1		1			
4.1.2		1			
4.1.3		1			
4.2.1	2	1			
4.2.2	2	1			
4.2.3	2	2			
4.3.1		1			
4.3.2		1			
4.3.3		1			
4.3.4			1		
4.3.5			2		
4.4.1				6	

GRADE 10 ASSESSMENT: MID-YEAR EXAMINATION

4.5.1		1			
4.5.2	1				
4.5.3	1				
4.5.4	1				
5.1.1	2				
5.1.2	4				
5.2.1			6		
5.2.2			3		
5.3.1				6	
Totals	20	35	30	15	100

