CHAPTER 1: QUADRATIC EQUATIONS

CHAPTER ANALYSIS

1. **Finding the maximum or minimum value of a quadratic function using the method of completing the square.**

2. **Sketching of quadratic graphs with axial intercepts and turning points.**

3. **Conditions for my quadratic equation to be always positive or always negative.**

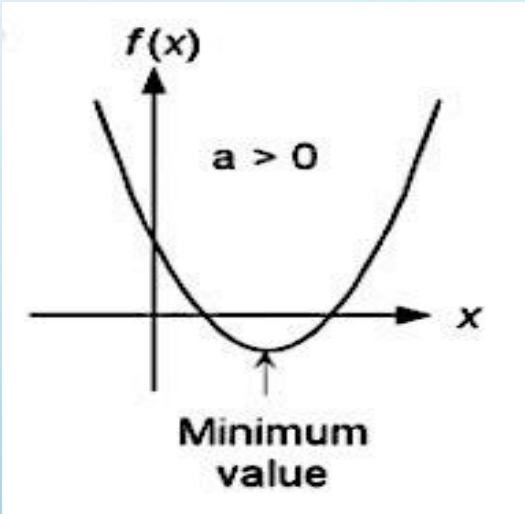
QUADRATIC FUNCTIONS

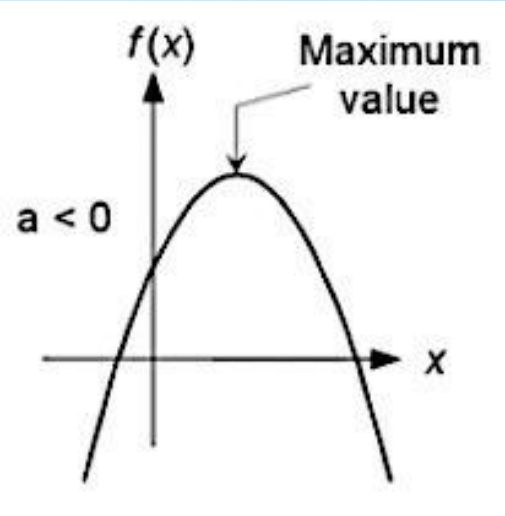
- A quadratic equation is in the form of $y = ax^2 + bx + c$, where a, b and c are constants.

Maximum / minimum point

Also known as the "Turning Point" or "Vertex" of a graph

Signature	Point
Positive $(a > 0)$	Minimum Point
Negative $(a < 0)$	Maximum Point





FINDING THE MAXIMUM AND MINIMUM POINT

Steps

In terms of the general case:

$$
\begin{aligned}
f(x) &= ax^2 + bx + c \\
&= a\left(x^2 + \frac{b}{a}x\right) + c \\
&= a\left[\left(x + \frac{b}{2a}\right)^2 - \left(\frac{b}{2a}\right)^2\right] + c \\
&= a\left(x + \frac{b}{2a}\right)^2 + \left[c - a\left(\frac{b}{2a}\right)^2\right] \\
&= a(x-h)^2 + k
\end{aligned}
$$

Real example:

$$
\begin{aligned}
f(x) &= x^2 + 9x + 12 \\
&= \left(x + \frac{9}{2}\right)^2 - \left(\frac{9}{2}\right)^2 + 12 \\
&= \left(x + 4\frac{1}{2}\right)^2 - 8\frac{1}{4}
\end{aligned}
$$

Important

Students must know how to deal with these 2 cases with factorising

- Coefficient of x^2 is negative

$$-x^2 + bx + c = -\left(x^2 - bx - c\right)$$

- Coefficient of x^2 is not 1

$$ax^2 + bx + c = a\left(x^2 + \frac{b}{a}x\right) + c$$

1) Complete the square

- When we complete the square and achieve the form of $y = a(x-h)^2 + k$, we are able to derive our turning point.

Coordinates of turning point = (h , k)

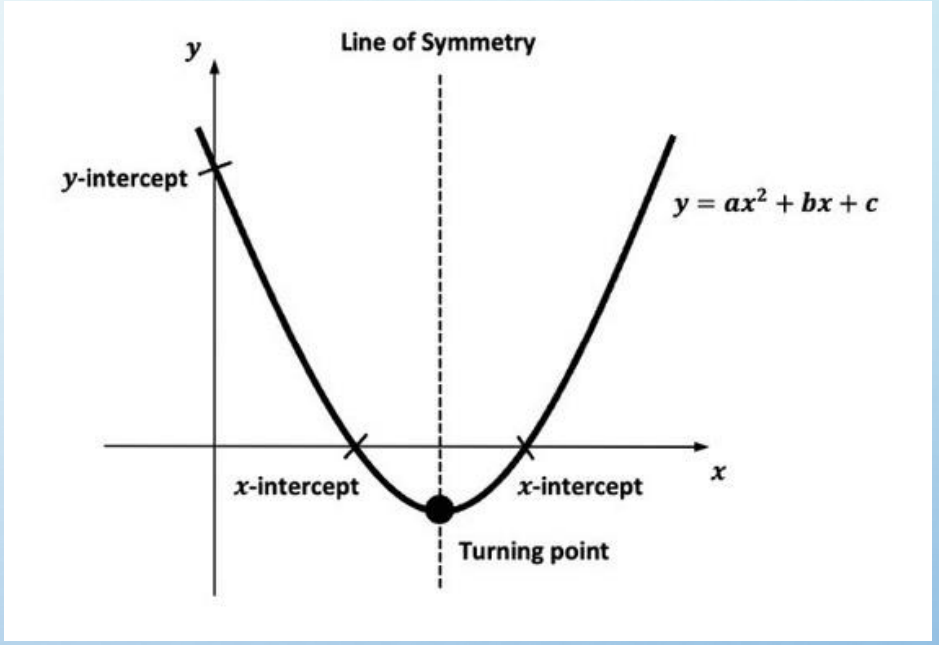
*Tip: Let the bracket $(x - h)$ to be equals to 0.

2) Using the line of symmetry

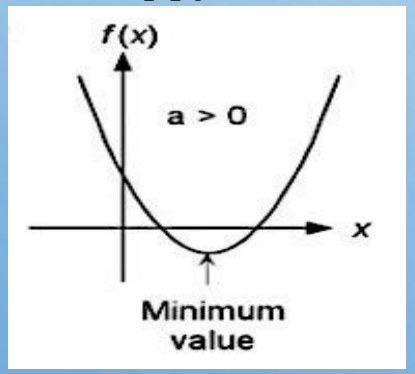
- Once we derive our x-intercepts, we can compute the line of symmetry by finding the midpoint: $\frac{x_1 + x_2}{2}$, where x_1 and x_2 are the x-intercepts.
- Sub in the value of x found from the previous step into the equation and find the value of y.

SKETCHING OF QUADRATIC GRAPH

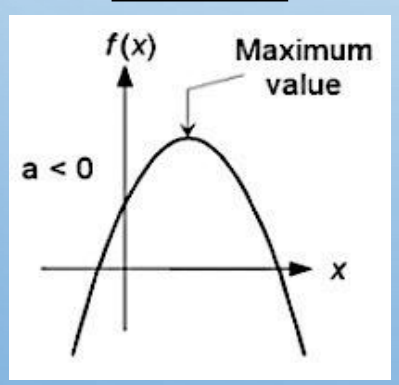
- To find the x-intercept, sub $y = 0$.
- To find the y-intercept, sub $x = 0$.
- To find the turning point, use either Complete the square or finding the line of symmetry (Refer to previous page)
- To determine the shape of the graph, we look at the coefficient of x^2.
  - If the coefficient of x^2 is more than 0, it is a happy face.
  - If the coefficient of x^2 is less than 0, it is a sad face.



Happy Face



Sad Face



Conditions to be always positive or always negative

Method 1: Complete the square

- When we complete the square and achieve the form of $y = a(x - h)^2 + k$, we can identify the maximum or minimun point.
- If the maximum point of the graph is below the x-axis, there will not be any intersections between the curve and the x-axis, therefore the graph will always be negative as it will always below the x-axis.
- If the minimum point of the graph is above the x-axis, there will not be any intersections between the curve and the x-axis, therefore the graph will always be positive as it will always be above the x-axis.

Method 2: Discriminant (This is covered in Chapter 2 so stay tune for our next chapter!)

- Conditions for always positive:

- The coefficient of x^2 is more than 0 AND the discriminant (always known as $b^2 - 4ac$) is lesser than 0.

- Conditions for always negative:

- The coefficient of x^2 is less than 0 AND the discriminant (always known as $b^2 - 4ac$) is lesser than 0.

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MEET OUR ALL-STAR TUTORS

All our tutors have between **7-13 years of teaching experience** and have guided countless batches of students to excel at ‘O’ Levels & ‘A’ Levels.

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SOME STATS

07

LOCATIONS

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20+

TUTORS

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70%

RESULTS

About **70%** of OVERMUGGED students score an A1/A2 at 'O' Levels/ 'A' Levels.

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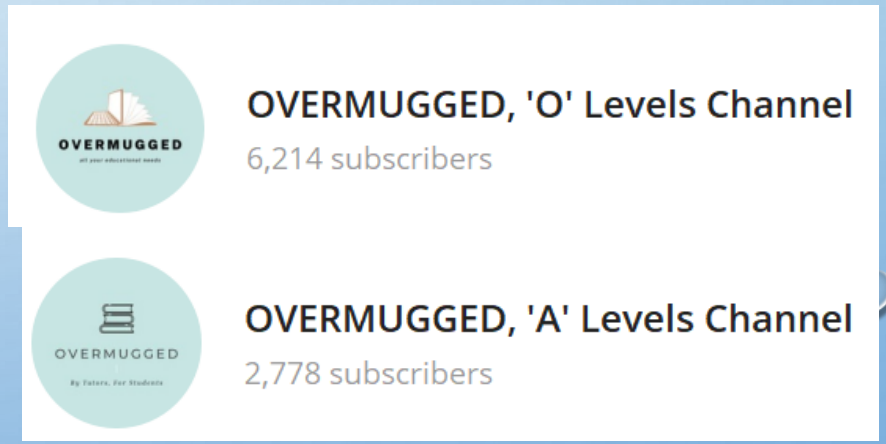
We have about 700+ students under our care which we work closely with on a week-on-week basis!

SG FASTEST GROWING TUITION BRAND

We believe in uplifting the student community!



One of SG largest Telegram student community

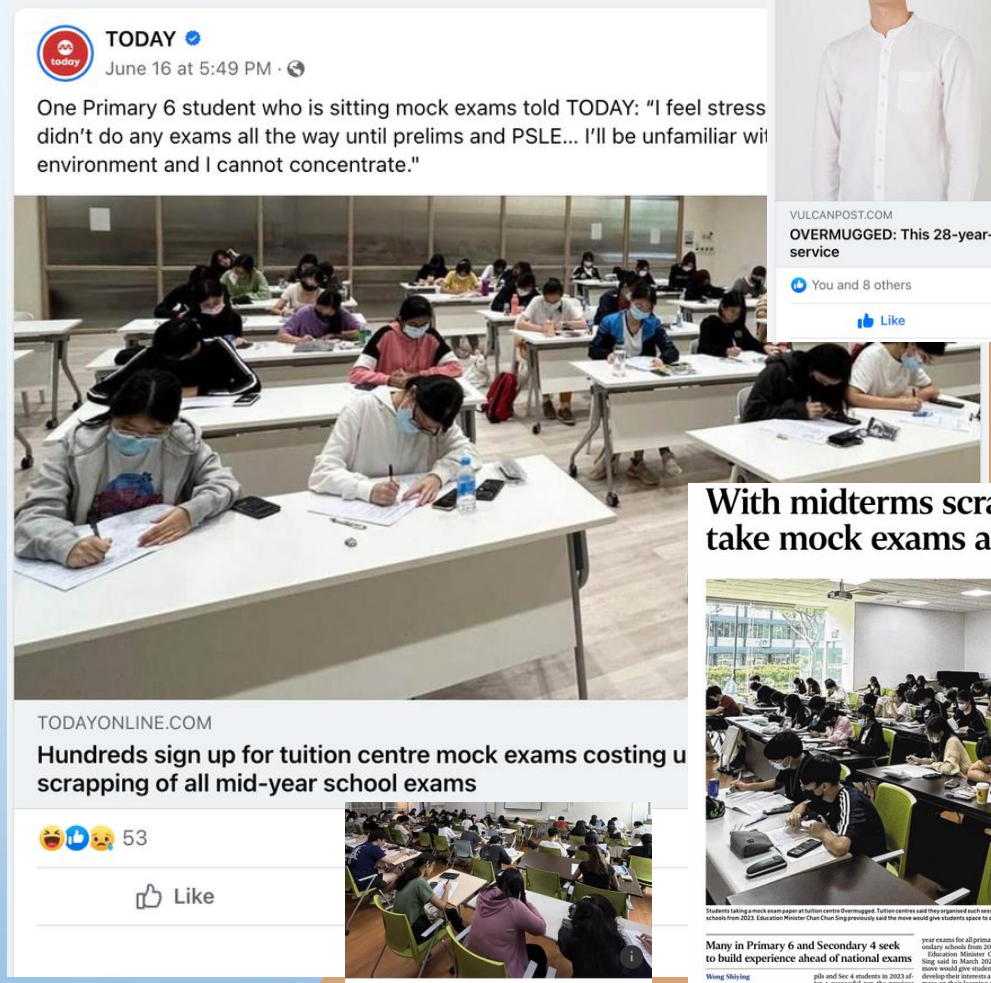
LEADERS IN THE CHANGING EDUCATION LANDSCAPE

FEATURED ON STRAITS TIMES

Our efforts to go out of our way to support our students were captured by local new publications.

OVERMUGGED was SG first tuition center to host **large scale mock exam**!

Our **student's needs comes first**!



P6 and Sec 4 students flock to tuition centres for mock exams after scrapping of school midterms

Wong Shiying
The Straits Times

With midterms scrapped, students take mock exams at tuition centres

Many in Primary 6 and Secondary 4 seek to build experience ahead of national exams

Wong Shiying

Sitting national exams involves some degree of exam-taking skills, such as not being able to consult external resources, knowing psychologically that your results will have important consequences and keeping to a time limit.

ASSOCIATE PROFESSOR JASON TAN, from the National Institute of Education, on why parents want their children to be familiar with the exam-taking experience.

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Kovan

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CLASSROOM

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CLASSROOM

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TAMPINES

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We grind hard when no one is watching because we know that when it comes time for exams, we will be one cut above the rest.

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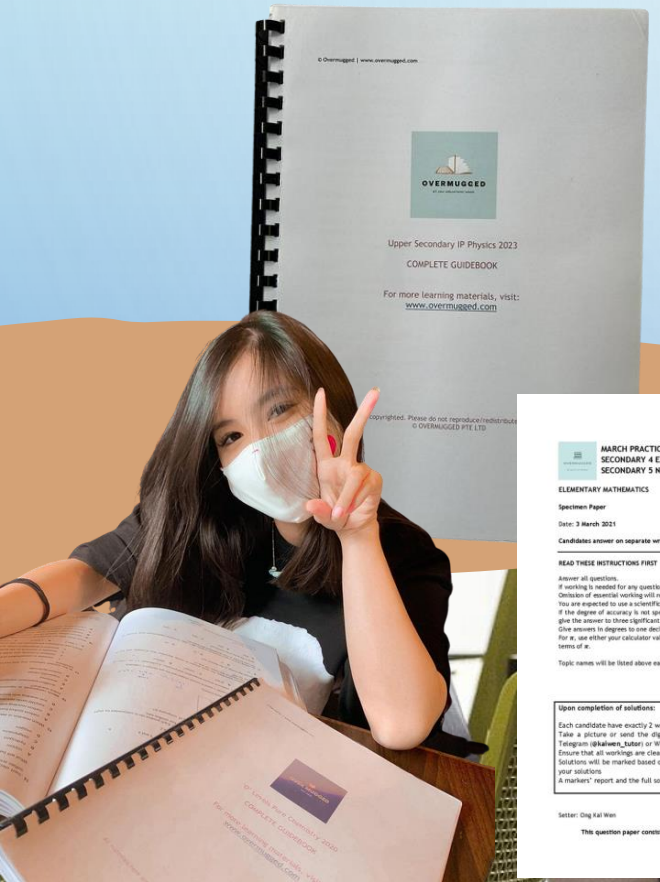
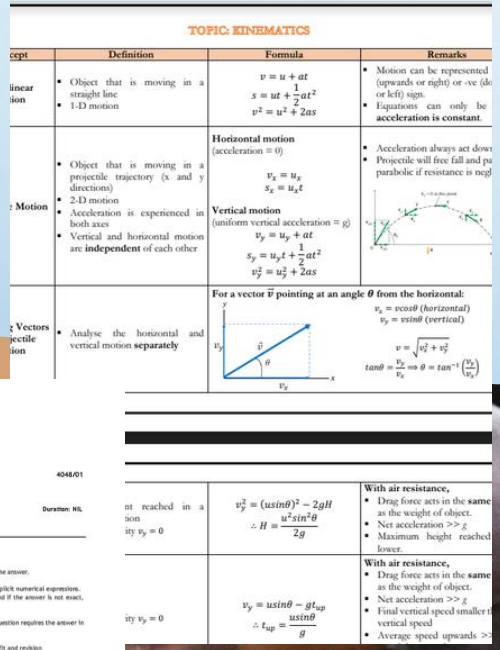
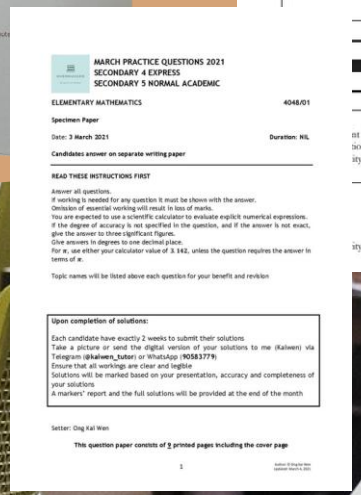
Topical, Thematic, Mock Test, Mock Exam, Prelim Prep, Practical Prep

EXCLUSIVE CHEATSHEETS

Revision booklets, extra cheatsheets, Practical Assessment booklet







WELFARE, ALL DAY EVERYDAY

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$80/lesson
$85/lesson (weekend)

INTEGRATED PROGRAM

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$95/lesson (weekend)

‘A’ LEVELS

$100/lesson
$105/lesson (weekend)
10% if signing up for 2 ‘A’ Levels subject & above

Fees are collected at the start of the term (every 3 months).

Our Policy

No deposit fee.
No extra material fee.
Unlimited access to study lounge.
Unlimited snacks.
Free consultations.
Special discounts for holiday program.

ACADEMIC YEAR

TERM 1: NOV - JAN

Topical Recaps

Key highlight: Christmas Party

TERM 2: FEB - APR

Topical Mastery

Key highlight: March Holiday Cohesion Program

TERM 3: MAY - JUL

Prelim/EOY Preparation

Key highlight: Mock Prelim/EOY

TERM 4: AUG - OCT

'O' Levels / 'A' Levels Preparation

Key highlight: Mock Exams, Science Practical Assessment

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Class Schedule:

SCAN ME

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SCAN ME

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