Each of the authors of this paper has used a different type of Computer Algebra System (CAS) integrated into the senior mathematics classroom in the new subject: Mathematical Methods CAS Units 1–4, as part of the VCAA CAS Pilot Study. Each of the classes involved has undergone a dramatic change in the way teaching and learning takes place. The paper focuses on the types of tasks and problems that are suited to a mathematics course where students have unrestricted access to CAS. A number of original analysis questions are presented. Approaches to solving these tasks, using a variety of hand-held and computer-based CAS, are discussed.

Introduction
The integration of Computer Algebra Systems into senior mathematics, as part of the Victorian Curriculum and Assessment Authority [VCAA] Computer Algebra System [CAS] Pilot Study, has resulted in dramatic changes to the way that teaching and learning take place. The dynamics of the classroom change with the calculator viewscreen (for hand-held CAS) or multimedia
projector (for PC-based CAS) becoming more of a central focus, and the multiple representations of numeric, graphic and symbolic forms are more easily demonstrated. It has been observed that the students move more easily between these representations, thereby giving a deeper and broader understanding of the concepts. One teacher’s response is:

I don’t any more teach the big introductory lesson with the notes and heading on top. That’s gone. All changed in a year. (Garner & Leigh-Lancaster, 2003, p. 376).

Another key issue is the locus of control in the classroom; teachers need to be flexible while students are discovering, often more quickly than the teacher, new ways to tackle a problem:

We were often surprised how quickly students learnt the syntax, and adapted to most of the idiosyncrasies of the calculator operations. Often students delighted in revealing to the class another discovery that they had made about a short cut or new method, or explain(ing) why a particular procedure might not work. (Tynan, 2003, p. 256)

Overview of VCAA CAS Pilot Study
Mathematical Methods CAS Units 1–4 were accredited in February 2001 (see HREF1), and pilot implementation initially consisted of three volunteer schools, commencing with Units 1 and 2 in Year 11 in 2001 and Units 3 and 4, with corresponding examinations, in Year 12 in November 2002. The pilot program has been progressively expanded, with students from 16 schools enrolling in Units 1 and 2 from 2002, and a staggered introduction of student enrolment in Units 3 and 4 from 2003 and 2004 respectively. The initial stage of the pilot proceeded in conjunction with a major Australian Research Council SPIRT grant for the CAS-CAT (Computer Algebra Systems: Curricula, Assessment and Teaching Project) project 2000–2002, a partnership between the Department of Science and Mathematics Education at the University of Melbourne, the VCAA and three calculator companies, Casio, Hewlett-Packard and Texas Instruments (see HREF2). The VCAA Mathematical Methods CAS Units Pilot Study 2001–2005, integrates the use of CAS in the curriculum, assessment and pedagogy of a senior secondary mathematics VCE subject (see Leigh-Lancaster, 2002, 2003; HREF3). The three authors
of this paper describe a journey of change in the approaches to teaching and learning that has been experienced in the classrooms of Ballarat Grammar School, Methodist Ladies College and Frankston High School in Victoria.

Ballarat Grammar was one of the three original pilot schools in the VCAA CAS Pilot Project for Units 1–4 Mathematical Methods. As part of the CAS-CAT Project, three initial pilot schools worked with each of the brands of hand-held CAS calculator, with the view to informing curriculum authorities and the wider educational community about the use of CAS in the classroom. The Project has led to a series of publications about students’ attitudes and learning, teacher and student change, as well as assessment issues (see Ball, Stacey, & Leigh-Lancaster, 2001; Flynn & Asp, 2002; Flynn, Berenson, & Stacey, 2002; Garner, 2002, 2003; Garner & Leigh-Lancaster, 2003; Pierce & Stacey, 2002; Stacey, Asp, & McCrae, 2000).

Students in Year 12 at Ballarat Grammar had access to the Casio FX 2.0+ calculator for over two years and sat their final exams in November 2002 in the new subject Mathematical Methods CAS. Frankston High School and Methodist Ladies College are part of the expanded pilot and are intending their students to sit their final Year 12 exams using CAS in 2003 and 2004 respectively. At Frankston High School, the 2003 Year 12 class is studying Mathematical Methods CAS using Derive 5 CAS software. However at Year 11 level, one class is using Derive 5, while the other Mathematical Methods CAS class is using the TI-92Plus (see Moya, 2002). Methodist Ladies College students are using computer-based Mathematica. It has been found, in all three schools, that there is a wide variety of methods in learning that occurs in the CAS classroom, and the teachers have also experienced a radically changed culture in the senior mathematics classroom when students are using the CAS in all aspects of learning and assessment (see Garner, 2003). The students, as part of the VCAA Pilot Study, have learnt the use of the Casio FX 2.0+, TI92, Mathematica or Derive based CAS, but significantly, also learning and exploring the mathematics necessary at VCE level in Victoria. Initially, it was expected that the use of CAS might be another series of techniques to learn and that the use of the calculator might lead to a series of tricks to avoid the mathematics that we have all done in past years. However it has been found that these students are fully integrating this new technology into their mathematics learning.
Multiple Representations

An interview with the first author as teacher highlights the increased emphasis on multiple representations.

I think with the CAS menu the kids have got a very good understanding of jumping from the CAS menu which is symbolic and which is your gradient function, to your other menus which give you numeric values. It gives them a very good understanding of the difference between it and how they link. Now, at the beginning I thought that was a disadvantage but I actually think that it’s an advantage, because you hear the language of the kids all the time. “Well that’s the numeric answer”. In the CAS menu we can find the numeric as well as the algebraic. It forces them to have an understanding early…

…In Year 12, when you teach being able to draw a gradient function graph from the original graph and vice versa in Methods. I have always found that difficult. The kids find it hard to visualise if they haven’t got the equation of the graph. They might be given the picture of the graph and in a multiple-choice question they have to say what the gradient function looks like. And in the old graphic calculator days, if they haven’t got an equation to punch in, it’s hard for them to visualise. My feeling in this Year 12’s, their understanding of that is much better, because I think they have a better feel for what the gradient function is. (Teacher S, 2002)

Considering the scientific calculator using numerical representation, the graphics calculator extending to graphical representation, and the CAS calculator including symbolic representation as well, it could be said that this transition to CAS calculators will likely be more influential. This is because the transition is not just another part of a continuum, but that CAS incorporates all three representations and completes the continuum.

Use of parameters

The ability of CAS to perform symbolic manipulation makes it ideal for defining functions with parameters, rather than being restricted to declaring constants. Consequently, students can more easily explore patterns by systematically changing the value of a parameter, explore families of curves and make
conjectures about the general form of an expression. This is illustrated by subsequent examples.

**Binomial expansion**

CAS provides students with a potent means of investigating mathematics by observing patterns. This is illustrated in Figure 1, where students can very easily observe the pattern for the binomial expansion of \((a + b)^n\), by systematically varying the value of the parameter, \(n\). Figure 1 shows that Derive 5 does this rather elegantly when the TABLE command is used, as the connection between the binomial coefficients and Pascal’s triangle is very clear.

The TI-89 and Voyage 200 are hand-held CAS technologies with different configurations, but identical functionalities. Figure 2 illustrates how these technologies can be used to observe the same pattern as shown in Figure 1. However, the limited screen size of the hand-held technology imposes limitations on the visual impact of the pattern.

As part of this investigation, students were required to verify the traditional formula: \(t_{r+1} = \binom{n}{r} a^{n-r} b^r\), where \(t_{r+1}\) is the \((r + 1)\)th term of the expansion. However, many traditional binomial theorem questions are
rendered trivial when students have access to CAS. In a CAS classroom, questions like the following are very straightforward.

Question: In the expansion of \( \left( px - \frac{q}{x} \right)^5 \), where \( p \) and \( q \) are positive real constants, the coefficient of \( x^3 \) is \(-810\) and the coefficient of \( x^{-1} \) is \(-720\). What are the values of \( p \) and \( q \)?

Solution: Figure 3 shows one approach to solving the problem. Using CAS to expand, the coefficient of \( x^3 \) is \(-4p^4q\) and the coefficient of \( x^{-1} \) is \(-10p^2q^3\). Hence, \( p \) and \( q \) can be found by solving simultaneously the equations 
\[-4p^4q = -810\] 
\[-10p^2q^3 = -720\]. The answer is \( p = 3 \) and \( q = 2\). The alternative is rejected because \( p > 0 \).

\[\text{Figure 2. TI-89/ Voyage 200, for } (a + b)^n.\]

\[\text{Figure 3. } p \text{ and } q \text{ can be found by solving the equations simultaneously.}\]

Family of curves

Given the ease with which parameters can be systematically varied, CAS is an ideal means of studying families of curves. In the following problem, students were required to investigate key features of the family of curves,

\[f(x) = \frac{x^4}{a^2} - \frac{x^2}{a},\]

where the parameter, \( a \), can take any positive real value.

Figure 4 shows graphs of \( f(x) \) for \( a = \{1, 2, 3, 4\} \). Of particular interest is the relationship between the values of the \( x \)-intercepts for the different curves. In Figure 5, the \( x \)-intercepts are found to be \( x = -\sqrt{a}, \sqrt{a}, 0 \).

Figure 6 shows how the positive \( x \)-intercepts provide a means of illustrating the values of \( \sqrt{1} \) to \( \sqrt{10} \) on a number line. This was used to investigate the connection between the roots of this family of curves, when \( a \) is an integer,
and the spiral of Archimedes. Figure 6 also illustrates that the difference between successive roots is getting smaller. By taking the limit, as \( a \to \infty \), it was confirmed that the difference between successive roots tends to zero, as shown in Figure 7.

Figure 4. The roots of \( f(x) \) in terms of \( a \).

Figure 5. The positive roots of \( f(x) \).

Figure 6. The difference between successive roots tends to zero.

Figure 7. The difference between successive roots tends to zero.

Figure 8. The coordinates of the minima, in terms of \( a \).
The coordinates of the local minima were also investigated. Figure 8 illustrates that all local minima have coordinates
\[ \left( \pm \frac{\sqrt{2a}}{2}, -\frac{1}{4} \right). \]
The relationship between x-intercepts and the x-ordinate of the local minima was explored.

**Continuous Random Variables**
The inbuilt normal distribution function and the ability of *Mathematica*, and other types of CAS, to perform integrals of the form
\[ \int_{-\infty}^{\infty} f(x)dx, \]
makes it a very powerful tool for dealing with continuous random variables. The following examples show how *Mathematica* can be used to find and interpret the mean, median, mode, variance and standard deviation of a continuous random variable.

**Finding the mean and standard deviation of the normal distribution**
CAS makes these types of questions reasonably straightforward.

**QUESTION**
If \( X \sim N (\mu, \sigma^2) \) and \( \Pr(X > 35) = 0.2 \) and \( \Pr(X < 5) = 0.1 \) find the mean and the standard deviation of the distribution. Give your answers correct to three decimal places.

**Solution**
\[ <<\text{Statistics`NormalDistribution`} \]
\[ \text{ndist3} = \text{NormalDistribution}[\mu, \sigma] \]
\[ \text{NormalDistribution}[\mu, \sigma] \]
\[ \text{NSolve}[\{1 - \text{CDF}[\text{ndist3}, 35] == 0.2, \text{CDF}[\text{ndist3}, 5] == 0.1\}, \{\mu, \sigma\}] \]
OR
\[ \text{Solve}[\{\text{Quantile}[\text{ndist3}, 0.8] == 35, \text{Quantile}[\text{ndist3}, 0.1] == 5\}, \{\mu, \sigma\}] \]
\[ \{\mu \rightarrow 23.1081, \sigma \rightarrow 14.1298\} \]

*Figure 9.* Using *Mathematica* to find the mean and standard deviation of a normally distributed random variable.

Figure 9 illustrates that the answer is \( \mu \approx 23.108 \) and \( \sigma \approx 14.130 \).
Other continuous random variables

In Unit 4 of Mathematical Methods (CAS), students are expected to be familiar with other types of continuous random variables, not just the Normal Distribution.

In the example above, a software package was downloaded to help carry out the calculations. *Mathematica* has many inbuilt packages for continuous random variables. Sometimes packages are unavailable and the following is an example of how to tackle such questions.

**QUESTION**

\[ f(x) = \begin{cases} \frac{ax(x - 1)(x - 2)}{0.38} & 0 \leq x \leq 1 \\ 0 & otherwise \end{cases} \]

is a probability density function (pdf), where \( a \) is an arbitrary real constant.

Find the

a) value of \( a \) and plot the graph of \( y = f(x) \)

b) mean

c) median

d) mode

e) variance

Give exact answers and answers correct to three decimal places.

**SOLUTION**

a) Figure 10 shows that the value of the parameter is \( a = 4 \).

\[
\text{Solve}\left[ \int_0^1 ax(x-1)(x-2)dx = 1, a \right]
\]

\( (a \rightarrow 4) \)

\( f[x_] := 4x(x-1)(x-2) \)

\( \text{Plot}[f[x], \{x, 0, 1\}, \text{AxesLabel} \{x,y\}] \)

\( \text{Figure 10. Using } \text{Mathematica} \text{ to find the value of the parameter that uniquely defines the probability density function.} \)

Note that the graph is not symmetrical about \( x = 0.5 \). If it were the mean = median = mode = 0.5.

b) The mean = \( E(X) = \int_0^1 (xf(x))dx = \int_0^1 (4x^2(x-1)(x-2))dx \).
Figure 11 illustrates how easily CAS evaluates the integral, to obtain the result that the mean value of the random variable is \( \frac{7}{15} \approx 0.467 \).

\[
\text{Solve}\left[\int_{0}^{1} (x \cdot f(x)) \, dx = \frac{7}{15}\right] \\
\text{N} = 0.466667
\]

Figure 11. Using Mathematica to evaluate the integral that gives the mean value of the random variable.

c) The median, \( m \), can be found using the rule: \( \int_{0}^{m} (4x(x-1)(x-2)) \, dx = \frac{1}{2} \).

Figure 12 shows that the value of the integral has to be equated to \( \frac{1}{2} \), rather 0.5, in order to get an exact answer. In this case, the domain cannot be restricted on Mathematica unless the FindRoot command is used. The median value of the random variable is found to be

\[
m = \frac{1 - \sqrt{16 - 8\sqrt{2}}}{4} \approx 0.459
\]

\[
\text{Solve}\left[\int_{0}^{x} f(x) \, dx = \frac{1}{2}\right] \\
\left\{ \begin{array}{l}
m \rightarrow \frac{1}{4} \left(4 - \sqrt{16 - 8\sqrt{2}}\right), \\
m \rightarrow \frac{1}{2} \left(2 - \sqrt{2(2 + \sqrt{2})}\right)
\end{array} \right\} \\
\text{N} = \{m \rightarrow 0.458804, m \rightarrow 1.5412, m \rightarrow 0.306563, m \rightarrow 2.30656\}
\]

\[
\text{FindRoot}\left[\int_{0}^{x} f(x) \, dx = \frac{1}{2}, \{m, \frac{4}{10}\}\right] \\
\{m \rightarrow 0.458804\}
\]

Figure 12. Using Mathematica to find the median, by solving for the value that yields an area of 0.5.

d) The mode occurs at the maximum value, found at the turning point. Figure 13 illustrates that Mathematica allows the value to be found by simply solving \( f'(x) = 0 \), where \( f(x) \) has been previously defined in Figure 10.

Hence the mode is \( \frac{1 - \sqrt{3}}{3} \approx 0.423 \).
The other value obtained is outside the specified domain.

\[
\text{Solve}[f'[x] == 0, x] \\
\text{\{\{x \to \frac{1}{3} (3 - \sqrt{3})\}, \{x \to \frac{1}{3} (3 + \sqrt{3})\}\}} \\
\text{N[\%]} \\
\text{\{\{x \to 0.42265\}, \{x \to 0.57735\}\}}
\]

\text{Figure 13. Using Mathematica to evaluate the mode of the distribution.}

e) \ \text{Var}(X) = \int_{-\infty}^{\infty} (x^2 f(x))dx - \mu^2.

Figure 14 shows how Mathematica can deal with these integrals, to obtain the result that the variance of the distribution is

\[
\frac{11}{225} \approx 0.049.
\]

\[
\int_{0}^{1} (x^2f(x))dx - \left(\int_{0}^{1} xf(x)dx\right)^2 \\
\frac{11}{225} \\
\text{N[\%]} \\
\text{0.04888889}
\]

\text{Figure 14. Using Mathematica to evaluate the integrals that yield the variance.}

\textbf{Average Value of a Function and Rates of Change}

\textit{Use of CAS in Circular Functions}

Trigonometry questions provide a unique set of advantages and disadvantages with the use of CAS. The research team in the CAS-CAT Project identified particular issues found in the early investigation into the use of CAS in the teaching of Circular Functions (see Stacey & Ball, 2001). It appears that the topic of Trigonometry reveals the most differences in syntax and techniques between differing brands of CAS. In the Casio FX2.0+, it has been found that the parametric solution of trig equations nicely gives solutions in terms of the parameter \(k\). The functions of \textit{tcollect} (trig collect) and \textit{texpand} (trig expand) in the CAS MENU are also enormously useful, but only if the student has had plenty of practice in the use of these two functions in comparison with Simplify and Expand in the TRNS facility.
An interview with the first author as teacher highlights the use of trig functions in CAS (bold indicates emphasis during the interview).

I wanted to round off trig. “How will I do this?” I’d talked to the kids about the really typical analysis questions that are asked about trig…

…It was Exam 2, Question 1. (see VCAA 2002). And I talked about how these trig questions come up all the time and even though we are in a CAS course, these trig questions are very typical of what can be asked. So I grabbed last year’s exam and Question 1 was this trig question. I thought as I went along, I’m going to get the kids to do it but I’m not going to give them any advice on what to use. I did say ‘This is last year’s exam, it is a non-CAS exam, so what I want you to do is think about how you would do it this year, because they could equally ask it this year, exactly the same. The question’s not going to look different, this particular question. So, I want you to do it how you would do it by choice. Then I got the students to come up and volunteer how they would do it. Particularly the solving of the trig equation…

…There was a very strong argument about the three different ways the students would solve this trig equation. One student came up, and he is the one who always complains about jumping from the CAS to non-CAS in Specialist. He came up and did it by hand, and it was a lovely solution, did it beautifully, no problems, no mistakes. It was quite a difficult trig equation to solve, there was a consideration of domain to look at, there was a translation, so it was quite difficult…

…And then someone else came up and showed how they would solve it on the graph, which, again on the CASIO because the graph menu is quite distinctly different, doing a G SOLVE intercept, talked about the fact that it had a decimal answer and “Did that matter?” and “Did the question specify it?” The question in fact did specify 2 decimal places so it didn’t request an exact answer…

…And then another student came up and did a CAS solution. Now the CASIO does the parametric solutions very nicely. I’ve talked about saying to the kids “Get used to writing k as a parameter. Just get used to writing it down because it shows you’re understanding the value of
k in the general solution. Then look at your k values and get a feel for how many solutions you expect”…

…And it raised fantastic discussions between the three of them as to which method they’d choose. And because it didn’t specify an exact answer, each of the three was equally valid. In the end I got the class to vote and it was split three-ways, equally. I was really, really interested because I always thought, at the beginning of the year, that my teaching would have been more directive and that by the end of the year they’d have all chosen one method. (Teacher S, 2002)

It is to be hoped that all teaching allows for this sort of autonomy of learning, however it has been observed, by the authors, that the use of CAS has increased this ease of considering a range of solutions (see Garner, 2002, p. 399).

**Average Value of a Function/Rates of Change**

A typical trig question below shows not only the use of CAS in the solution, but also the new material of Average Value of a Function, included in the new accredited CAS Methods course (see HREF1).

**QUESTION**

The temperature outside a building during a particular 24-hour period is modelled by the function

\[ f(t) = 24 - 10 \cos \left( \frac{\pi t}{12} \right), \quad 0 \leq t \leq 24 \]

where \( f(t) \) is measured in degrees Celsius and \( t \) is measured in hours after midnight. A builder, working to union rules, is permitted to work outside the building only when the temperature is less than 32°C. Otherwise he works inside.

1. For what times of the day can the builder work outside the house, given that he has lights set up and can work at night as well as during the day? Give your answer in hours and minutes.

   There is some thought that the above ruling should change to less than or equal to 29°C.

2. For what times of the day can the builder work outside the house if this new ruling comes into effect? Give your answer in exact terms.

3. Sketch a graph of \( f \).
4. Find the average temperature between \( t = 8 \) and \( t = 12 \) giving your answer both in exact terms and correct to nearest degree.
5. Find the average rate of change of temperature, in Celsius per hour, correct to two decimal places, between \( t = 8 \) and \( t = 12 \).
6. Find the rate of change of temperature, with respect to time, correct to two decimal places, when \( t = 8 \).

Solutions using the Casio FX2.0+

Store the function \( f(t) = 24 - 10 \cos \left( \frac{\pi t}{12} \right) \) as \( Y_1 \) and Graph over required domain, as in Figure 15.

1. Solve for \( y = 32 \)
   \[ x = 9.54, x = 14.46 \]
   work outside from midnight till 9:32 am
   then from 2:28 pm until midnight

2. Solve \( 29 = 24 - 10 \cos \left( \frac{\pi t}{12} \right) \)
   \[ t = 24k - 8, -24k + 8 \]
   \[ \therefore t = 8, 16 \]
   work outside from midnight till 8 am
   then from 4 pm until midnight

3. Figure 15. Using the Casio FX2.0+ to graph \( f(t) \) over \([0, 24]\).

4. Average value from \( a \) to \( b \) is \( \frac{1}{b - a} \int_a^b f(t) \, dt \)

Average temperature \( = \frac{1}{12 - 8} \int_8^{12} Y_1 \, dt = \frac{60\sqrt{3}}{\pi} + 96 = \frac{24\pi + 15\sqrt{3}}{\pi} \degree C \)
To nearest degree \( = 32 \degree C \)
5. Average rate of change = \( \frac{f(b) - f(a)}{b - a} \)

Average rate of change = \( \frac{f(12) - f(8)}{12 - 8} = \frac{34 - 29}{4} = 1.25^\circ C/hour \)

6. CALC Diff Y1, 8 = 2.27^\circ C/hour

The above are suggested solutions only, and typically students will find different solution techniques, ranging from the use of the parameter \( k \) in the CAS solution, to solving the equations numerically in the GRAPH MENU. For example in part 1 of this question, the solution offered is that of a graphical point of intersection in the trig graph at \( y = 32 \). An alternative solution is that of solving the trig equation

\[ 32 = 24 - 10 \cos \left( \frac{\pi t}{12} \right) \]

in the CAS MENU. A problem here, that we have found a way around, is that the parameter \( k \) is not in the same syntax language as the \( k \) on the keyboard. The solution to the equation can be recalled and the \( k \) renamed to allow substitutions of \( k = 0, 1, 2 \). Naturally substitution by-hand of the \( k \) values avoids this issue. Figures 16 to 20 show the screen dumps from the Casio FX2.0+ to illustrate this.

*Figure 16.* Solve function = 32.

*Figure 17.* Solve function = 32, showing 2nd solution.

*Figure 18.* Recall expression into active screen.
Conclusion

The authors of this paper are passionate about using CAS to enhance the teaching and learning of mathematics. Their involvement in the VCAA CAS Pilot Study has been an exciting development for them and for their students. The unrestricted use of CAS has led to dramatic changes in pedagogy and assessment in each of the three schools. CAS has proved to be a powerful learning tool that allows students to move between numeric, graphical and symbolic representations of a problem. It also allows students to observe patterns and explore concepts.

Traditionally, the focus of senior mathematics courses has been on how to carry out mathematical procedures, such as solving equations and differentiating expressions. CAS has made it possible to increase the emphasis on the understanding of concepts and on helping students to decide when and why it might be appropriate to apply a particular procedure. Unrestricted access to CAS has challenged us, as educators, to start inventing new paradigms for the teaching and learning of senior mathematics.

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GENERALISED SOLUTION OF CUBIC EQUATIONS

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This paper will demonstrate Cardan’s solution of a cubic of the form 
\[ x^3 + ax + b = 0 \] through a case study. It will be seen that through Pascal’s binomial theory this can be modified to solve the generalised cubic of the form 
\[ ax^3 + bx^2 + cx + d = 0, \] again through a case study. Synthetic division will be used to arrive at the other two solutions of the cubic equation. Finally, tips on setting cubics for VCE students to solve will be offered, and the limitations of the method will be investigated.

Introduction
In VCE Mathematical Methods Unit 1, students are taught how to graph user-friendly cubics of the form \( y = a(x - h)^3 + k \) for integer values of \( a, h \) and \( k \). The solution of the equation \( a(x - h)^3 + k = 0 \) yields an \( x \)-intercept of such equations. The solution is given by

\[
x = h - \frac{3\sqrt[3]{k}}{\sqrt[3]{a}}.
\]

But have you ever wondered how less user-friendly cubics are solved algebraically? Moreover, how can you use the method in your VCE mathematics classes?