# HILLCREST HIGH SCHOOL

**HILLCREST HIGH SCHOOL**
INTERNAL ASSESSMENT

## GRADE 11

## MATHEMATICS
## Paper 1
## JUNE 2022

**MARKS:** 100

**TIME:** 2 hours

**STUDENT NAME:** _____ **TEACHER:** _____

| QUESTION | ONE | TWO | THREE | FOUR | FIVE | SIX | SEVEN | TOTAL |
|---|---|---|---|---|---|---|---|---|
| TOTAL | 14 | 33 | 7 | 10 | 4 | 13 | 19 | 100 |
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## INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of 13 pages and 6 questions, with a formula sheet at the back
2. Read the questions carefully.
3. Answer ALL the questions.
4. Number your answers exactly as the questions are numbered.
5. Clearly show ALL calculations, diagrams, graphs, etc. which you have used in determining your answers.
6. Answers only will NOT necessarily be awarded full marks.
7. You may use an approved scientific calculator (non-programmable and non-graphical), unless stated otherwise.
8. If necessary, round off answers correct to TWO decimal places, unless stated otherwise.
9. Diagrams are NOT necessarily drawn to scale.
10. Write neatly and legibly.

Formula:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

## QUESTION 1

Simplify the following expressions without the use of a calculator. SHOW ALL WORKING!

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| **1.1** | $16^{\frac{3}{4}}$ | (3) |
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| **1.2** | $\frac{2\sqrt{45}-\sqrt{80}}{\sqrt{20}}$ | (4) |
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| **1.3** | $24^{3x-2} \cdot 8^{1-x} \cdot 12^{2-3x}$ | (4) |
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| **1.4** | $\frac{3^{2022}-3^{2021}}{3^{2020}}$ | (3) |
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**[14]**

## QUESTION 2

Solve for $x$ in each of the following:

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| **2.1** | $(x-2)(3x+5)=0$ | (2) |
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| **2.2** | $2x^2-8x=10$ | (4) |
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| **2.3** | $3x^2-9x+2=0$ (correct to 2 decimal places) | (3) |
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| **2.4** | $\sqrt{2x+14} = x+3$ | (6) |
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| **2.5** | $2 \cdot 3^{2x-1} = 18$ | (3) |
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| **2.6** | $x^{\frac{1}{2}} - 9x^{\frac{1}{4}} - 10 = 0$ | (4) |
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| **2.7** | $3x - 6 > 5x + 2$ | (2) |
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| **2.8** | $x^2 \leq 4$ | (3) |
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| **2.9** | Solve for $x$ and $y$ in the following equations: | (6) |
| | $2x + y - 1 = 0$ and $y^2 = x$ | |
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## QUESTION 3

The following quadratic sequence is given:

$$T_n = 3n^2 - 6n$$

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|---|---|---|
| **3.1** | Determine the values of the first 3 terms of the sequence. | (3) |
| | **$T_1$ =** | |
| | **$T_2$ =** | |
| | **$T_3$ =** | |
| **3.2** | Which term in the sequence will have a value of 144? | (4) |
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## QUESTION 4

4.1 The following **linear sequence** is the sequence of first differences of a quadratic number pattern:

**-13; -9; -5; -1 ; …**

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| **4.1.1** | State the general term of the linear sequence. **-13; -9; -5; -1 ; …** | (2) |
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| **4.1.2** | If the first term of the quadratic number pattern is 201, determine the next TWO terms. | (2) |
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4.2 Given the quadratic sequence: **4 ; 9 ; 18 ; 31 ; …**

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|---|---|---|
| **4.2.1** | Determine the next TWO terms of the sequence. | (2) |
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| **4.2.2** | Determine, $T_n$, the general term of the sequence above. | (4) |
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**[10]**

## QUESTION 5

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| Calculate the value of $x$ in the quadratic sequence below.<br><br>$\mathbf{5x+2}$ ; $\mathbf{x-1}$ ; $\mathbf{3}$ ; $\mathbf{10}$ ; $\mathbf{\ldots\ldots}$ | |
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**[4]**

## QUESTION 6

Given $f(x) = \frac{3}{x-1} + 2$

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| **6.1** | State the equations of the asymptotes of $f$ | (2) |
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| **6.2** | Determine the coordinates of the $x$-intercept | (3) |
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| **6.3** | Determine the co-ordinates of the $y$-intercept | (2) |
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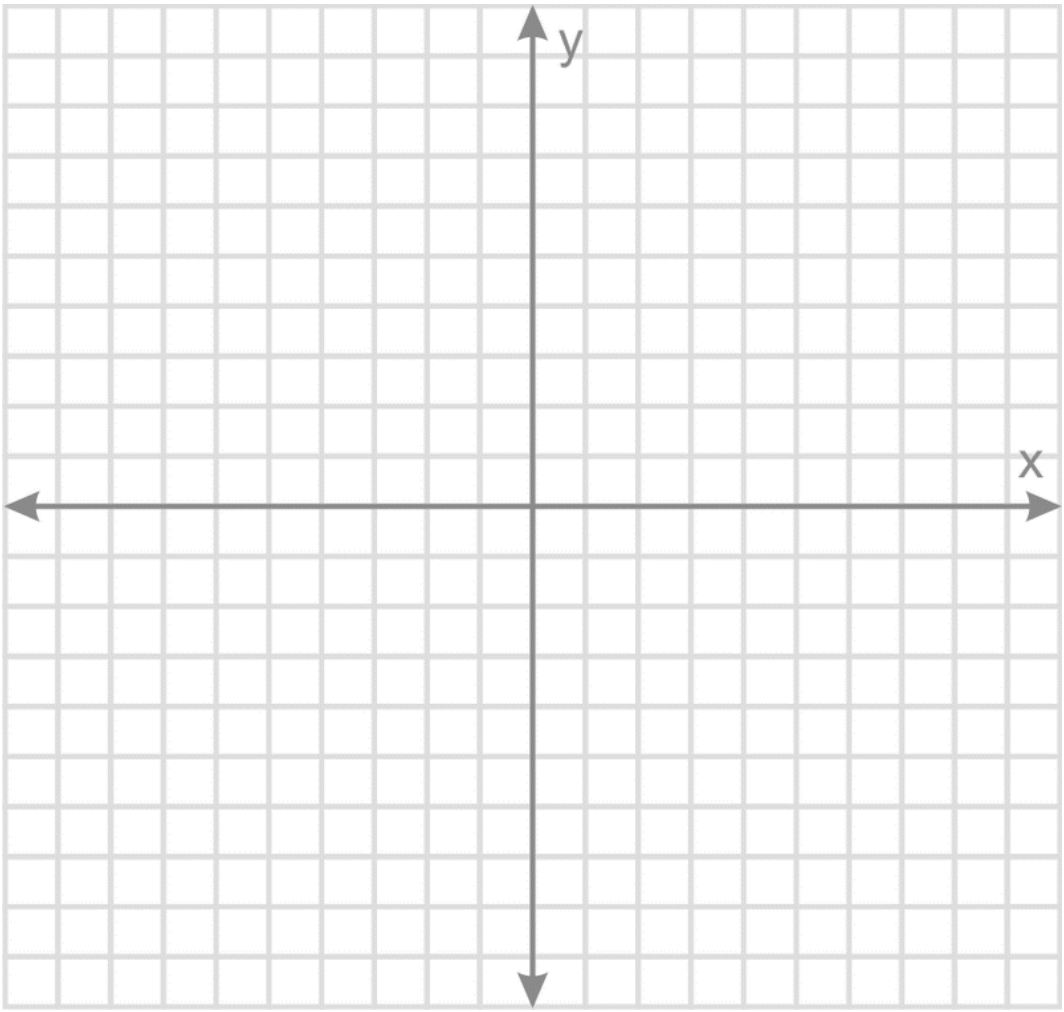
| **6.4** | Draw a neat sketch of the graph of $f(x)$, with labels, on the axes provided below, showing clearly its intercepts, asymptotes. | (3) |
| |  | |
| **5.6** | If a straight line in the form $g(x) = mx + c$ exists such that it passes through both intercepts of $f$, find the values of $m$ and $c$ | (3) |
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**[13]**

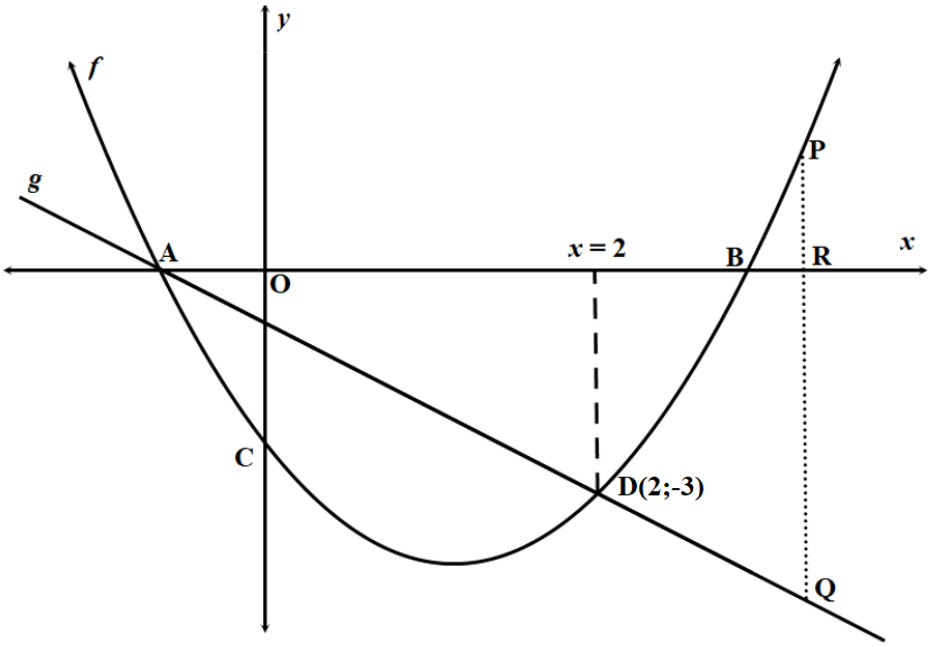
## QUESTION 7

The sketch below represents the graphs of $f(x)=x^2-2x-3$ and $g(x)=mx+c$.

P is a point on *f* and Q is a point on *g* such that PQ is parallel to the *y*-axis.

A and B are the *x*-intercepts of *f*. The straight line, *g*, passes through point D(2 ; -3).

D is the intersection of *f* and *g* at $x=2$

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|---|---|---|
| **7.1** | Determine the coordinates of A and B, the *x*-intercepts of *f*. | (3) |
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| **7.2** | Show that $m=-1$ and $c=-1$ for the straight line $g(x)$. | (3) |
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| **7.3** | Determine the coordinates of the turning point of $f$, showing all working. | (3) |
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| **7.4** | Write down the domain and range of $f$. | (3) |
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| **7.5** | Determine the length OR, given $\text{PQ} = 10 \, units$ | (4) |
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| **7.6** | Determine the value(s) of $x$ where $g(x) \leq 0$. | (1) |
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| **7.7** | Determine the value(s) of $x$ where $f(x) < g(x)$. | (2) |
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| | | **[19]** |

**TOTAL: 100 MARKS**