BERGVLIET HIGH SCHOOL

# MATHEMATICS DEPARTMENT

## NOVEMBER EXAMINATION

## GRADE 11

## MATHEMATICS PAPER 1

**November 2021**

**MARKS:** **100**

**TIME:** **2 HRS**

**SET BY:** **S Gibbs**

**MODERATED BY: K Grebe**

### INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of 6 questions on 7 typed pages.
2. Clearly show ALL calculations, diagrams, graphs, et cetera that you have used in determining your answers.
3. Answers only will not necessarily be awarded full marks.
4. You may use an approved scientific calculator (non-programmable and non-graphical), unless stated otherwise.
5. If necessary, round off answers to TWO decimal places, unless stated otherwise.
6. Diagrams are NOT necessarily drawn to scale.
7. Number the questions correctly according to the numbering system used in this question paper.
8. Detach the diagram sheet on page 7 and staple it to the FRONT of your answer sheet.

## QUESTION 1

1.1 Solve for $x$:

1.1.1 $(3x-2)(2x-3)=0$ (2)

1.1.2 $7x^2+3x-2=0$ (correct to two decimal places) (3)

1.1.3 $x^2+2x-8\geq 0$ (3)

1.1.4 $\sqrt{2x+1}=x-1$ (5)

1.1.5 Find the value of: $10^{x+3}$ if $10^x=\frac{1}{2}$ (2)

1.1.6 $2^x-16.2^{-x}=6$ (4)

1.2 Solve for $x$ and $y$ simultaneously

$x-2y=-3$ (6)
$xy=20$

**[25]**

## QUESTION 2

2.1 Simplify, without the use of a calculator.

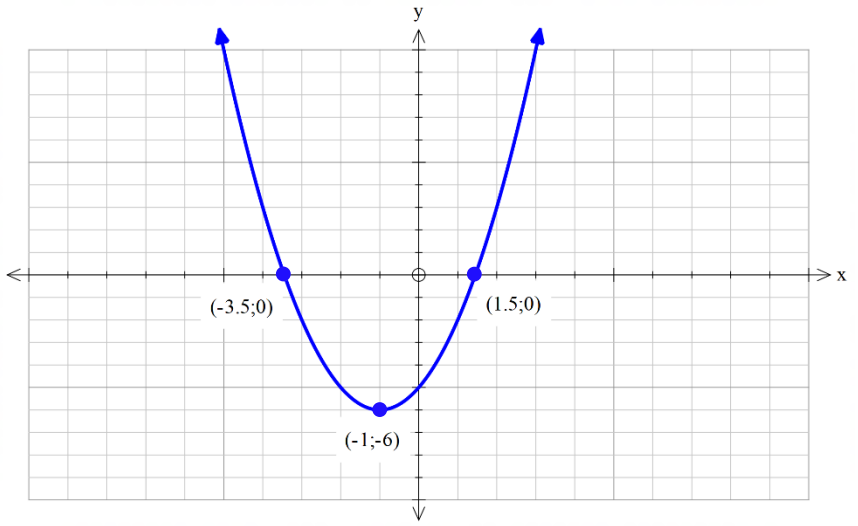
2.1.1 $\frac{2^{x+2}.4^{x+1}}{8^{x-1}}$ (3)

2.1.2 $\left(\frac{125x^7}{x}\right)^{\frac{2}{3}}$ (3)

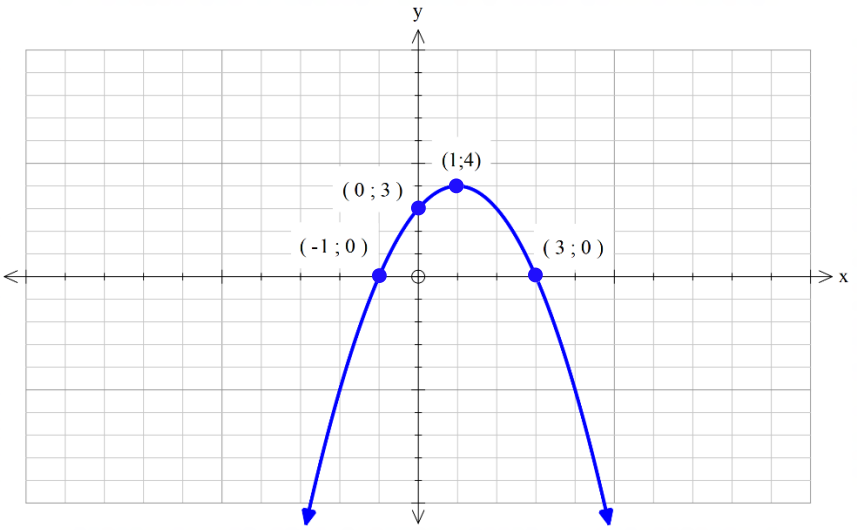
2.1.3 $\frac{\sqrt{27x^6}-\sqrt{48x^6}}{\sqrt{12x^6}}$ (3)

2.1.4 $\sqrt{1+\frac{1}{2}}\sqrt{1+\frac{1}{3}}\sqrt{1+\frac{1}{4}}\sqrt{1+\frac{1}{5}}\sqrt{1+\frac{1}{6}}\sqrt{1+\frac{1}{7}}$ (3)

2.2 2.2.1 State the nature of roots for the following parabola.
Comment on whether the roots of the graph are equal or unequal **and** whether the roots are positive or negative. (2)




2.2.2 Decribe in words the smallest shift needed in order to make the roots of the following graph non-real. (2)




2.3 If $f(x) = 0$ has roots $x = \frac{-5 \pm \sqrt{3-12k}}{4}$, for which values of $k$ will the roots be equal? (2)

**[18]**

## QUESTION 3

3.1 Consider the following quadratic pattern: -7 ; 0 ; $x$ ; 20 ; 33 ; 48 …..

3.1.1 Determine the value of $x$. (1)

3.1.2 Determine the formula for the $n$th term of the pattern. (4)

3.1.3 A new pattern, $P_n$ , is formed by adding 3 to each term in the given quadratic pattern. Write down the general term of $P_n$ in the form $P_n = an^2 + bn + c$ (1)

3.1.4 Which term of the sequence in 3.1.3 has the value of 428? (4)

3.2 A linear pattern has a difference of 3 between consecutive terms and it's 20th term is equal to 64. ($T_{20} = 64$).

3.2.1 Determine the value of $T_{22}$. (1)

3.2.2 Which term in the pattern will be equal to $3T_5 - 2$? (4)

**[15]**

## QUESTION 4

Given: $f(x) = -x^2 + 6x + 7$ and $g(x) = \frac{4}{x-3} + 2$

4.1 Determine the coordinates of the turning point of $f(x)$. (3)

4.2 Determine the $x$ intercepts of $f(x)$. (2)

4.3 Write down the equations of the asymptotes of $g(x)$. (2)

4.4 Write down the equation of $h(x)$ if $h$ is the reflection of $g$ in the $x$ axis. (2)

4.5 Sketch $f(x)$ and $g(x)$ on the same set of axis on the diagram sheet provided. Show clearly all the intercepts and asymptotes. (4)

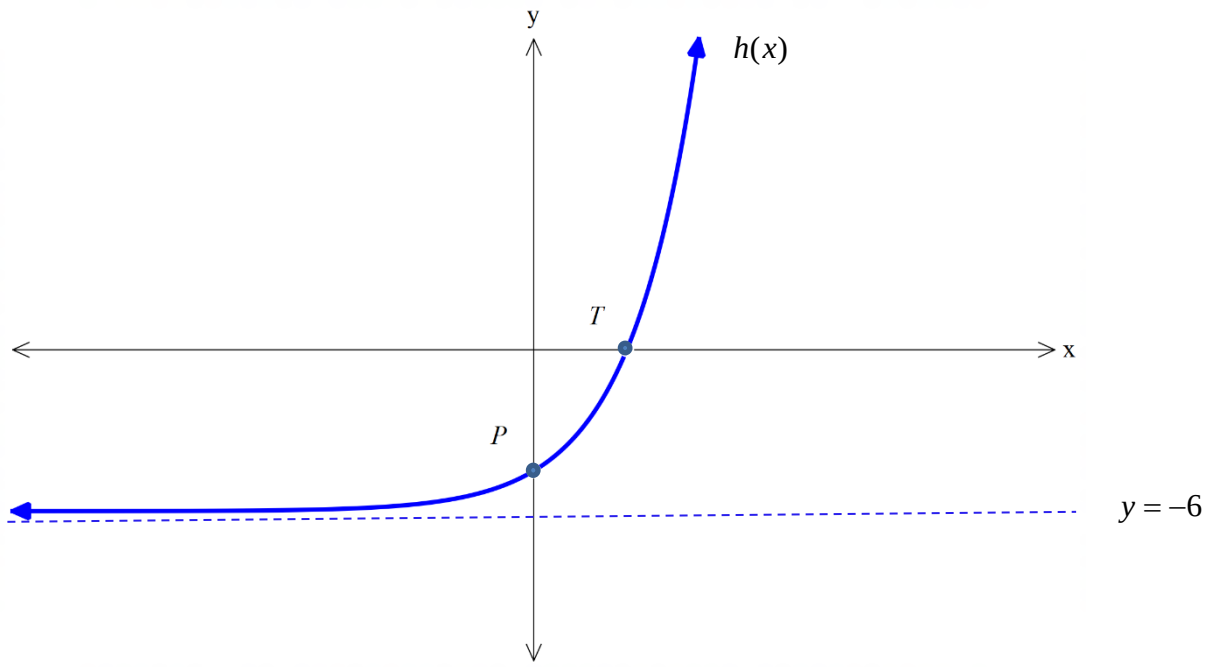
4.6 Write down the equation of the line of symmetry for $g(x)$ that has a negative gradient. (2)

4.7 The line $y = x - 1$ intersects $g(x)$ at P(1;0) and Q. Write down the coordinates of Q. (4)

**[19]**

## QUESTION 5

Given : $h(x) = a.2^{x-1} + q$. The line $y = -6$ is the asymptote to the graph $h(x)$.
P is the $y$ intercept of $h$ and T is the $x$ intercept of $h$.




5.1 Write down the value of $q$. (1)

5.2 If the graph $h(x)$ passes through the point $\left(-1;-5\frac{1}{4}\right)$, show that $a = 3$. (3)

5.3 Calculate the average gradient between P and T. (5)

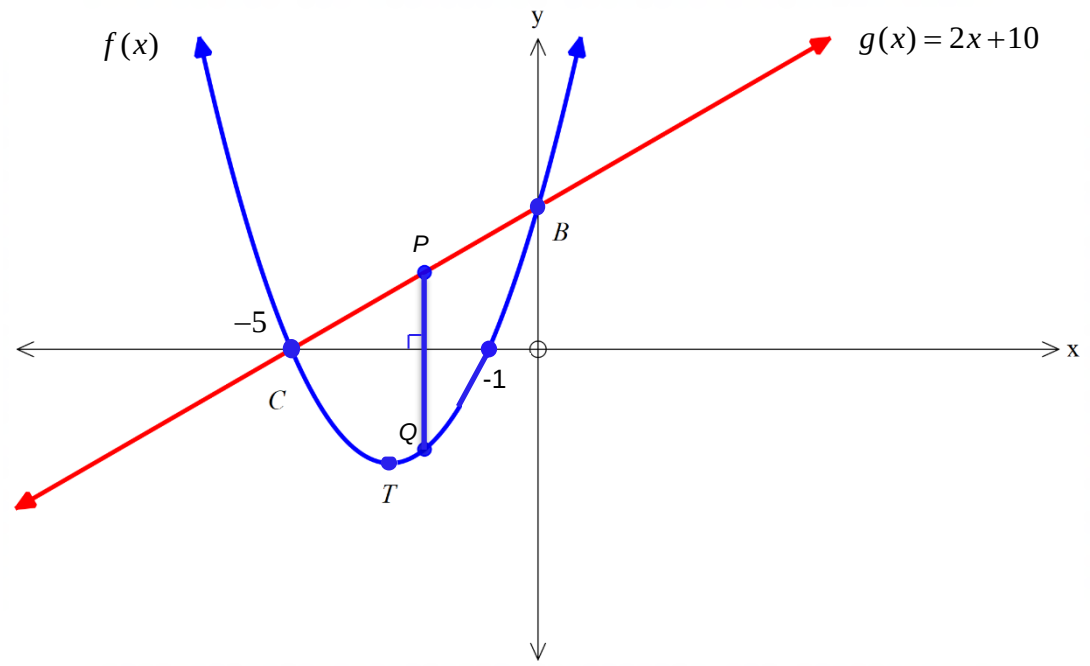
5.4 Determine the equation of $s$ if $s(x) = h(x+3) - 1$ in the form $s(x) = 3.2^{x-1} + q$ (2)

**[11]**

## QUESTION 6

The diagram below shows the graph of $f(x) = ax^2 + bx + c$ and $g(x) = 2x + 10$.

$C$ and $B$ are the points of intersection and $T$ is the turning point.




6.1 Determine the equation of $f(x)$. Show that $a = 2$, $b = 12$ and $c = 10$. (4)

6.2 Write down the range of $f(x)$. (3)

6.3 Determine the length of PQ, if P has a $y$ value of $6$. $[P(x;6)]$ (3)

6.4 For which values of $x$ is $f(x).g(x) < 0$? (2)

**[12]**

TOTAL **[100]**

**GRADE 11 MATHS PAPER 1 ANSWER SHEET**
**MATHS TEACHER**: Gr / Na / Or / Gi / Jo / St

**NAME: _____**

4.5

