HILLCREST HIGH SCHOOL

Grade 10 Mathematics Exam
June 2018

Examiner: M Cole Moderator: M Woodrow

MARKS: 100 TIME: 2 hours

INSTRUCTIONS AND INFORMATION
Read the following instructions carefully before answering the questions.

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

QUESTION 1

1.1 Simplify the following expressions fully:

1.1.1 $(m-2n)(m^2-6mn-n^2)$ (3)

1.1.2 $\frac{x^3+1}{x^2-x+1}-\frac{4x^2-3x-1}{4x+1}$ (5)

1.2 Prove that $0,\dot{2}\dot{4}\dot{5}$ is rational. (4)

[12]

QUESTION 2

2.1 Determine, **without the use of a calculator**, the value of *x* in each of the following:

2.1.1 $x^2-4x=21$ (3)

2.1.2 $96=3\times 2^x$ (3)

2.2 Determine without the use of a calculator, between which two consecutive integers $\sqrt{51}$ lies. (2)

2.3 Solve for p and q simultaneously if:

$6q + 7p = 3$
$2q + p = 5$ (5)

[13]

QUESTION 3

3.1 $3x + 1$; $2x$; $3x - 7$ … are the first three terms of a linear number pattern.

3.1.1 If the value of *x* is three, write down the FIRST THREE terms. (3)

3.1.2 Determine the formula for T_n, the general term of the sequence. (2)

3.1.3 Which term in the sequence is the first to be less than – 31? (3)

3.2 The multiples of three form the number pattern: 3 ; 6 ; 9 ; 12 ; …
If a new pattern is made using just the even numbers of the above number pattern,
Determine the 13^{th} number in this pattern that is even. (3)

[11]

QUESTION 4

Given: $f(x) = \frac{3}{x} + 1$ and $g(x) = -2x - 4$

4.1 Sketch the graphs of f and g on the set of axes provided on the DIAGRAM SHEET. (6)

4.2 Write down the equations of the asymptotes of *f*. (2)

4.3 Write down the domain of *f*. (2)

4.4 Solve for x if $f(x) = g(x)$. (5)

4.5 Determine the values of x for which $-1 \leq g(x) < 3$. (3)

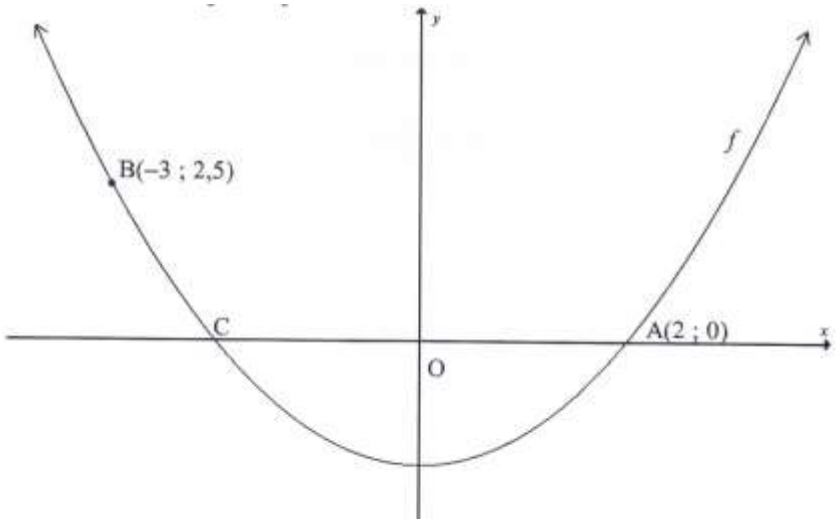
4.6 Determine *'c'* for $y = -x + c$, the axis of symmetry of *f*. (1)

4.7 Write down the coordinates of the *x*- and *y*-intercepts of h if h is the graph of g reflected about the *y*-axis. (2)

[22]

QUESTION 5

The graph of $f(x) = ax^2 + q$ is sketched below.
Points A(2 ; 0) and B(-3 ; 2.5) lie on the graph of *f*.
Points A and C are *x*-intercepts of *f*.



5.1 Write down the coordinates of C. (1)

5.2 Show the equation of *f(x)* is equal to $f(x) = \frac{1}{2}x - 2$ (4)

5.3 Write down the range of *f*. (1)

5.4 Write down the range of h, where $h(x) = -f(x)$. (2)

[8]

QUESTION 6

6.1) **Simplify the following:**

6.1.1) $\sin 45°$ (1) 6.1.2) $\cot 25{,}4°$ (1)

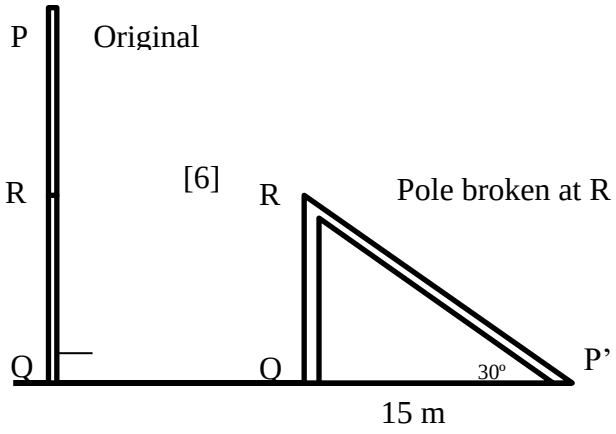
6.1.3) $2tan15°$ (1) 6.1.4) $\sin^2 30 + \cos^2 30$ (1)

6.2) **Solve for θ if $\theta \epsilon$ [$\mathbf{0°}$; $\mathbf{90°}$]**

6.2.1) $2cos\theta = 0{,}124$ (2) 6.2.2) $\sin 2\theta = 0{,}5$ (2)

6.2.3) $tan2\theta = 0.266$ (2) 6.2.4) $\frac{\sin(\theta - 10)}{3} = 0{,}102$ (3)

6.3**)** A pole broke at point R which resulted in the top portion of the pole, PR, forming an angle of 30º with the ground at P', now 15m away from Q, the foot of the pole.
Calculate the original height PQ of the pole (correct to one decimal place). (6)



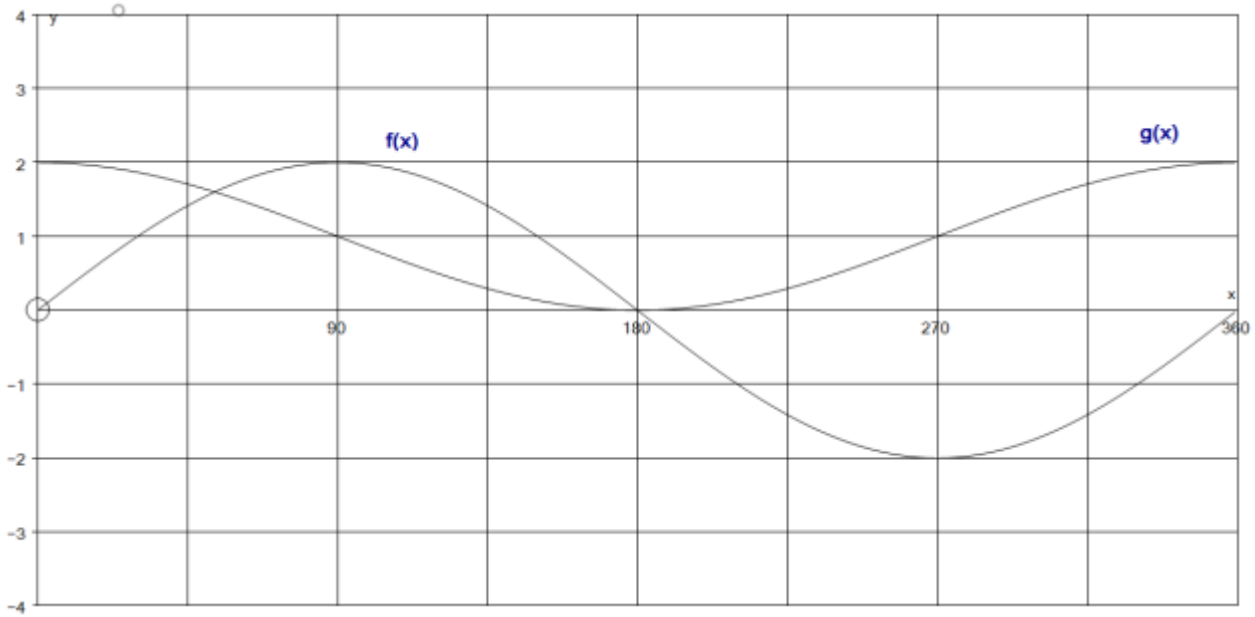
6.4) If $\cos\theta = -\frac{5}{13}$ and $0^\circ \leq \theta \leq 180^\circ$, using a diagram and not a calculator, determine the value of

$$sin\ \theta \times \frac{1}{tan\theta}$$ [5]

[24]

QUESTION 7

The graphs of $f(x) = 2\sin x$ and $g(x) = \cos x + 1$ for the domain $0° \leq x \leq 360°$ are given.



7.1) For what values of x is $g(x) = 2$? (2)

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

7.3) What is the period of $g(x)$? (1)

7.4) What is the range of $g(x)$? (2)

7.5) For which values of x is $f(x) < 0$? (2)

7.6) What will the equation of g become if the x-axis is moved up 2 units? (2)

[10]

Total 100

NAME:								
TEACHERS NAME:								
QUESTION	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**TOTAL**
TOTAL	**12**	**13**	**11**	**22**	**8**	**24**	**10**	**100**
MARKS								
MARKER								

Question 4.1