

HILLCREST HIGH SCHOOL

GRADE: 11
TIME: 2HOURS

MAY 2011
MARKS: 100

INSTRUCTIONS:

1. This paper consists of 7 questions.
 2. Ensure your class and the name of your Mathematics teacher is written on your answer booklet and on the diagram sheet provided.
 3. Answer **ALL** the questions.
 4. All the necessary working details must be shown.
 5. Number your answers clearly and correctly.
 6. Non-programmable calculators may be used unless the question states otherwise.
 7. Unless otherwise stated, where necessary, give answers correct to 2 decimal places.
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Question 1

1.1 Solve for x , rounded to TWO decimal places where necessary:

1.1.1 $x^2 - x - 12 = 0$ (3)

1.1.2 $x^2 - 6x = -6$ (3)

1.1.3 $x^2 + 4 = 0$ (1)

1.1.4 $x^2 + 5x - 6 \geq 0$ (3)

1.1.5 $\frac{x}{x-2} = \frac{1}{x-3} + \frac{2}{x-2}$ (5)

1.2 Solve for x , by completing the square, leave your answer in surd form.
 $x^2 + 8x = 4$ (5)

[20]

Question 2

2.1 Determine the values of x and y if they satisfy both the following equations simultaneously:

$y = x - 1$ and $y + 7 = x^2 + 2x$ (5)

2.2 Simplify

$\frac{x^2 - y^2}{x^2} \times \frac{x}{x - y}$ (3)

[8]

Question 3

3.1 A school has furniture and equipment valued at R330 000. The depreciation is calculated at a rate of 15% p.a. on a straight line basis. Calculate the value of the furniture and equipment at the end of 4 years.

(3)

3.2 Nosipho invests a certain sum of money for 5 years. She receives interest of 12% per annum compounded monthly. The money grows to R75 000 at the end of the 5-year period.

3.2.1 Calculate the effective rate per annum. (4)

3.2.2 Calculate how much money Nosipho invested initially. (4)

[11]

Question 4

4.1 Given the pattern:



Pattern 1

Pattern 2

Pattern 3

4.1.1 How many stars will there be in pattern 4? (1)

4.1.2 How many stars will there be in the n^{th} pattern? (5)

4.2 Given the sequence: 201; 197; 193; 189; ...

4.2.1 State whether this pattern is linear or quadratic and why. (2)

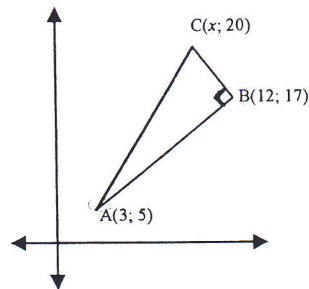
4.2.2 Find a formula for the n^{th} term. (3)

4.2.3 Find the value of the 50th term. (2)

[13]

Question 5

5.1 In the diagram below, $\triangle ABC$ is a right-angled triangle with $CB \perp AB$. $\triangle ABC$ has vertices $A(3; 5)$, $B(12; 17)$ and $C(x; 20)$.

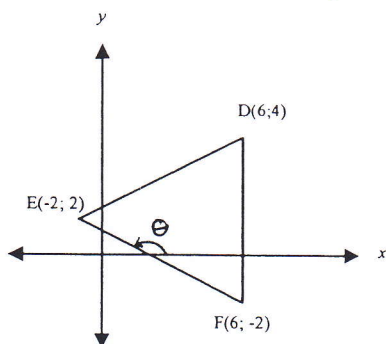


5.1.1 Determine the gradient of AB. (2)

5.1.2 Hence, write down the gradient of BC. (1)

5.1.3 Now determine the value of x . (3)

- 5.2 In the diagram below, $\triangle DEF$ has vertices $D(6; 4)$, $E(-2; 2)$ and $F(6; -2)$ in the Cartesian plane. The angle of inclination of EF is θ .

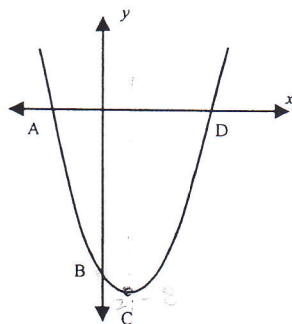


- 5.2.1 Determine the coordinates of midpoint M of DE . (3)
 5.2.2 Determine the gradient of EF . (2)
 5.2.3 Now, find the equation of EF . (3)
 5.2.4 Determine the size of θ . (3)

[17]

Question 6

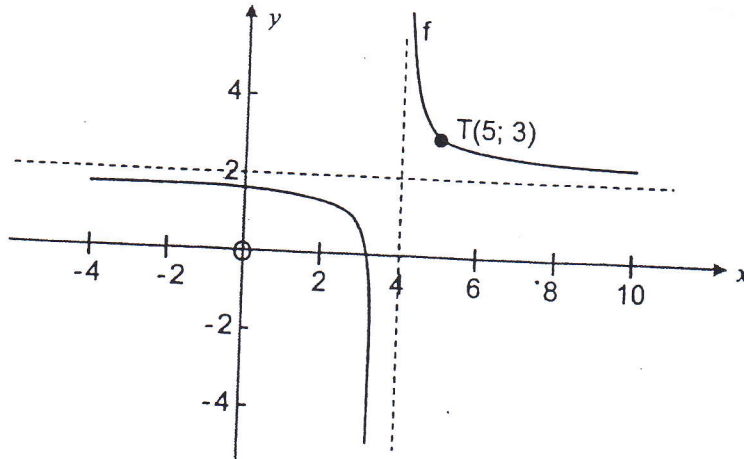
- 6.1 Refer to the figure. Sketched (not drawn to scale) is the graph of $f(x) = 2(x-1)^2 - 8$



- 6.1.1 Give the domain and range of f . (2)
 6.1.2 Give the coordinates of the turning point C , hence give the axis of symmetry. (2)
 6.1.3 Determine the coordinate of B (y -intercept). (2)
 6.1.4 g is the graph that results when f is shifted horizontally to the left so that C , is on the y -axis. Give the equation of g in the form $g(x) = \dots$ (2)

6.2 The diagram below represents the graph of $f(x) = \frac{a}{x-p} + q$.

T(5; 3) is a point on f .



- 6.2.1 Determine the equation of $f(x)$. (4)
 6.2.2 Give the equations of the asymptotes. (2)
 6.2.3 If one line of reflection for the graph of f has the equation $y = -x + c$, determine the value of c . (3)

[17]

Question 7

Two fragrances A and B are used to make the perfumes *Laughter* and *Joy*.

- 3g of fragrance A and 4g of fragrance B are required to produce 1 litre of *Laughter*.
- One litre of *Joy* requires 9g of fragrance A and 6g of fragrance B.
- At least 3 litres of *Laughter* needs to be produced per week.

At the beginning of a particular week the company has 27g of fragrance A and 30g of fragrance B.

Let x and y be the number of litres of *Laughter* and *Joy* respectively that are produced per week.

- 7.1 If one constraint of this problem is $3x + 9y \leq 27$, state algebraically, in terms of x and y , the other two constraints that apply to this problem for this week. (2)
 7.2 Represent the constraints graphically on the answer sheet provided and shade the feasible region. (6)
 7.3 If the profit of 1 l of *Laughter* is R30 and the profit on 1 l of *Joy* is R50, express the profit, P , in terms of x and y . (2)
 7.4 Determine how many litres of each perfume must be produced in this week to ensure a maximum profit. (3)
 7.5 What is the maximum profit? (1)

[14]

THE END