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HUDSON PARK HIGH SCHOOL

GRADE 10

MATHEMATICS

Paper 1

TIME: 3 Hours

DATE: 4 November 2013

MARKS:150

EXAMINER: Miss Pearce

Instructions

- 1) Illegible work, in the opinion of the marker, will earn zero marks.
- 2) Number your questions clearly and accurately
- 3) Start each question at the top of a new side of a page.
- 4) Hand in your answers and question paper separately
- 5) Employ the relevant formulae and show all working out. Answers alone may not be awarded full marks.
- 6) Non programmable and non- graphical calculators may be used, unless their usage is specifically prohibited.
- 7) Round off to 2 decimal places where necessary, unless instructed otherwise.

Question 1 (5 Marks)

1.1) If a and b are integers and c is irrational, which of the following are rational numbers.

a) $\frac{-b}{a}$

b) $c \div c$

c) $\frac{a}{c}$

d) $\frac{1}{c}$

1.2) Rewrite $1,28$ as an improper fraction

Question 2 (10 Marks)

2.1) Multiply the following by removing the brackets and then simplify if possible.

2.1.1) $y(x + 3) - 6y$

2.1.2) $(x^3 - y^3)(x^6 + y^6)(x^3 + y^3)$

2.1.3) $3(x - 1)(x + 1) - 4(2x - 3)^2$

2.2) If $(a + b)^2 = 12$ and $ab = 2$, calculate the value of:

$a^2 + b^2$

Question 3 (10 Marks)

Factorise the following fully

3.1) $x(3x - 2) - y(3y - 2)$ (5)

3.2) $\frac{1}{1000}x^3 + \frac{27}{64}$ (3)

3.3) $10x^2 - \frac{1}{5}x + 6$ (2)

Question 4 (2 Marks)

Determine without the use of a calculator:

$\frac{1999}{19982-1}$ (2)

Question 5 (13 Marks)

Simplify the following fractions by making them one term, where necessary.

5.1) $\frac{2x^2+x-6}{2x^2+4x}$ (3)

5.2) $\frac{x+\frac{1}{y}}{\frac{x}{y}-1} \div \frac{x+y}{x-y}$ (4)

5.3) $\frac{2}{y^2-1} + \frac{3}{2-y-y^2} - \frac{1}{y^2+3y+2}$ (6)

Question 6 (33 marks)

Solve for x

6.1.1) $\frac{5+x}{x} = -4$ (1)

6.1.2) $x^2 - 3x = 0$ (2)

6.1.3) $4x^2 + 9 = 15x$ (3)

6.1.4) $2x^3 - 3x^2 + 8x - 12 = 0$ (4)

6.1.5) $\frac{6x-9}{x-3} = \frac{3(2x-3)}{x-3}$ (2)

6.1.6) $3x^{\frac{4}{5}} - 2 = 0$ (4)

6.1.7) $h = \sqrt{\frac{x-1}{x+2}}$ (4)

6.2) Given : $-2 \leq \frac{x}{2} + 3 < 8$

6.2.1) Solve for x (2)

6.2.2) State your answer for 6.2.1) on a number line. (1)

6.2.3) State your answer for 6.2.1) in interval notation. (1)

6.3) Solve for x and y:

$$x - y = 1$$

$$3y + 4x = 25$$

(4)

6.4) Solve for y :

$$2^{2y} - 17 \cdot 2^y + 72 = 0$$

(5)

Question 7 (8 marks)

7.1) Simplify the following fully

7.1.1) $(a^y + b^y)^2$

(2)

7.1.2) $3y^{\frac{1}{5}}(2y^{\frac{1}{5}} - 5y^{\frac{-1}{3}})$

(2)

7.2) If $3^x = k$, rewrite the following in terms of k :

7.2.1) 81^x

(2)

7.2.2) 3^{x-1}

(2)

Question 8 (10 marks)

8.1) If 13; 10; 7...

8.1.1) Write down an expression for the n-th term of the sequence T_n and simplify the expression

(3)

8.1.2) In which position will you find the first term lower than -44?

(3)

8.2) If $3x - 1; 2x + 3; 2x - 1$ are the first 3 terms of an arithmetic sequence. Calculate x.

(4)

Question 9 (7 Marks)

Draw rough graphs of the following, on a separate set of axis.

9.1) $y = ax^2 + q$ if $a < 0$ and $q = 0$

(2)

9.2) $y = \frac{k}{x} + q$ if $k > 0$ and $q < 0$

(3)

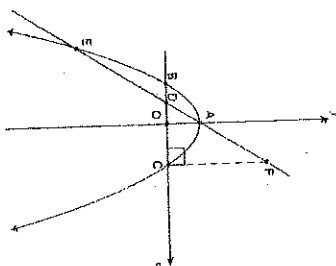
9.3) $y = ax + q$ if $a < 0$ and $q < 0$

(2)

Question 10 (14 Marks)

The graphs of $f(x) = 1 - x^2$ and $g(x) = 2x + 1$ are sketched below.

Using the graphs answer the questions which follow.



10.1) Calculate the co-ordinates of A. (2)

10.2) Calculate the co-ordinates of B (2)

10.3) Determine the co-ordinates of E (4)

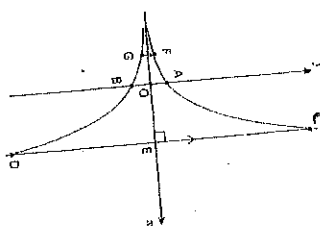
10.4) For which values of x is:

10.4.1) $g(x) \geq f(x)$ (4)

10.4.2) $f(x)$ increasing (2)

Question 11 (13 Marks)

Sketched are the graphs $y = 3^x$ and $y = -3^x$. FG and CED are line segments parallel to the y -axis. F, G, C and D lie on the graphs.



11.1.1) Calculate the co-ordinates of A and B. (2)

11.1.2) Calculate CD if OE = 2 units (3)

11.2) Given $f(x) = \frac{-5}{x} + 6$

11.2.1) What is the equation of the horizontal asymptote of $f(x)$? (1)

11.2.2) Draw a sketch of $f(x)$ clearly indicating all intercepts and asymptotes (4)

11.2.3) What is the domain of $f(x)$? (1)

11.2.4) State the equation of the axis of symmetry of g if

$g(x) = f(x) \quad (x > 0)$ (2)

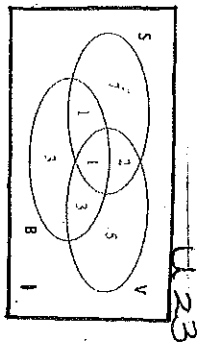
Question 12(13 Marks)

- 12.1) A couple purchases an entertainment system valued at R 17 255. They put down a 15% deposit and pay off the balance using a hire-purchase agreement, over 4 years. The company charges 12% interest p.a and an insurance fee of R 150 per month. Calculate the couple's monthly installment (6)
- 12.2) Jeremy invests R 3 375 in an account for 5 years at 15% pa compounded monthly. How much is in the account at the end of the investment period (3)
- 12.3) After many ^{hours} years will an insect population triple if it grows at 7% compounded annually? (4)

Question 13 (12 Marks)

- 13.1) Learners in Grade 10 were surveyed about their subject choices.
- 150 were surveyed
 - 125 did Life sciences
 - 85 did science
 - 55 did Life sciences, but not science
 - 10 Did neither
- Draw a Venn diagram depicting the above information. Let A be Life sciences and B be Science (4)

- 13.2) The Venn diagram below represents the sports choices of 23 learners at a Sports Academy. Learner may choose to play soccer(S), volleyball(V), baseball(B) or any combinations of the three sports or neither.



Calculate the probability that a person chosen at random does:

- 13.2.1) only one sport (1)
- 13.2.2) does all three sports (1)
- 13.2.3) does any sport but baseball (1)
- 13.2.4) does volleyball or soccer (1)
- 13.2.5) does not play any sport (1)

- 13.3) Two events A and B are mutually exclusive.

- $P(B^c) = 0,3$
- $P(A \cup B) = 0,8$

Calculate $P(A)$ (3)

150 Marks