



**ST MARY'S DSG, KLOOF**

**GRADE: 11**

**NOVEMBER 2016**

**MATHEMATICS: PAPER I**

**Examiner: J van Rooyen**

**Moderators: A. Emmott  
S. Thompson**

**TIME: 2,5 HOURS**

**TOTAL: 125 MARKS**

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**INSTRUCTIONS:**

1. This question paper consists of 9 pages.
2. There are 4 sections. Answer each section on a new sheet of paper.
3. **Write your name and Maths teacher's name on each sheet of paper.**
4. A formula sheet has been provided.
5. Diagrams are not drawn to scale.
6. Please give all answers correct to 2 decimal places unless otherwise indicated.
7. Read all the questions carefully.
8. Number your answers exactly as they have been numbered in the question paper.
9. An approved non-programmable and non-graphical calculator may be used, unless otherwise specified.
10. Make sure that your calculator is in degree mode.

**NAME:** \_\_\_\_\_

**TEACHER'S NAME:** \_\_\_\_\_

**SECTION A [33]****QUESTION 1** (answers may be left in surd form for this question only )

(a) If  $(x - \sqrt{5})(2^x - 8) = 0$

(1) Solve for  $x \in Z$  (2)

(2) Solve for  $x \in Q'$  (1)

(b)  $2x^2 + 10x + 7 = 0$  (3)

(c) If  $x = \frac{-42 \pm \sqrt{42^2 - 1764}}{18}$  will the roots be:

(1) Real or non-real? (1)

(2) Equal or not equal or neither? (1)

(d) Solve for  $x$ , if  $2x^2 > 7x + 15$ . (5)

[13]

**QUESTION 2**

The following contingency table shows information on the drivers' tests of 100 potential drivers tested at a test centre in eThekweni.

	Male	Female	Total
Pass	(q)	(s)	(u)
Fail	7	16	(r)
Total	37	(t)	(p)

(a) Give the values of the missing numbers labelled (p) - (u) (3)

(b) A driver is randomly selected from the 100 drivers.

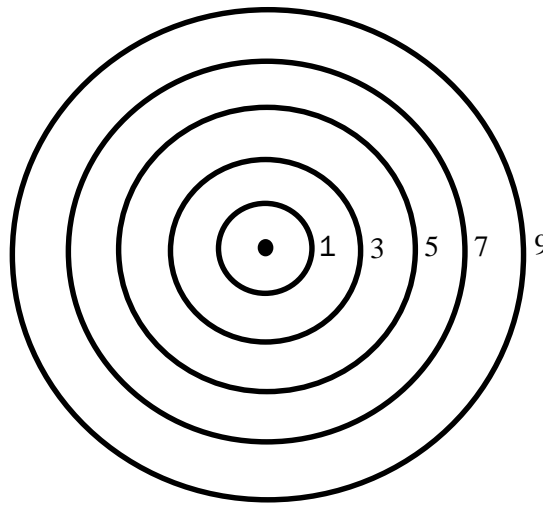
(1) Determine the probability that a female that failed is selected. (2)

(2) Determine the probability that the driver passed, given that it is male. (2)

[7]

### QUESTION 3

- (a) The figure shows concentric circles with the radius of each circle given just outside the relevant circle.



- (1) Give the  $T_n$  expression for the radius of any circle above. (1)
- (2) Give the area of the 18<sup>th</sup> circle. (2)
- (b) Give the  $T_n$  expression for the following sequence: 5; 2; -7; -22 ... .... (4)
- (c) (1) Give the next two terms in the following sequence  $\frac{1}{4}; \frac{2}{7}; \frac{4}{10}; \frac{8}{13}; \dots$  (2)
- (2) Determine the value of  $T_{25}$  leaving your answer in exponential form. (4)

[13]

### SECTION B [38]

START ON A NEW FOLIO SHEET

### QUESTION 4

Simplify the following:

- (a)  $\frac{3^{x+2} - 3^{x-2}}{4 \cdot 3^{x-3}}$  (3)
- (b)  $\sqrt{81a^4} - \sqrt{64p^{10}} + \sqrt{9a^4} - \sqrt[3]{512p^{15}}$  (4)
- (c) A new Golf is bought for Mary Jane this year and costs R540 000. The value of the car decreases at 11% per annum according to a reducing balance. Calculate the value of this car after 8 years. (2)

[9]

### QUESTION 5

(a) Determine the effective interest rate if an investment earns interest at 11,5% p.a. compounded quarterly. (3)

(b) Kelly and Lara receive R 15 000 each. They decide to invest the money for a period of 8 years as follows:

Kelly: 8,7% simple interest per annum. At the end of the 8 years Kelly receives a cash bonus of 3% on the Principal amount paid into her account.

Lara: 6,9% interest per annum compounded monthly

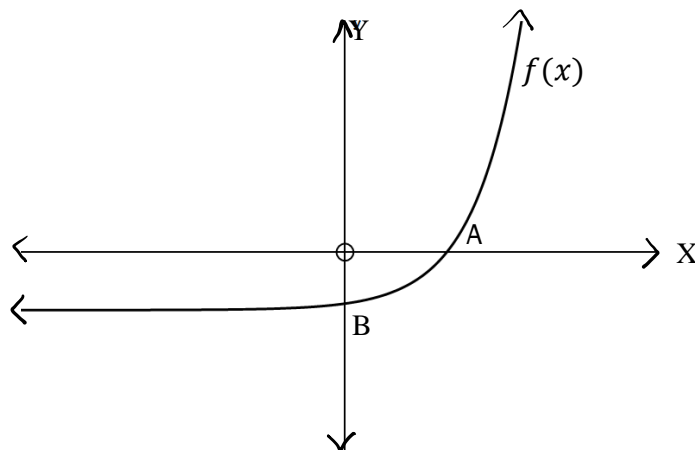
(1) Calculate the value of Kelly's investment after 8 years, including the bonus. (3)

(2) Calculate the value of Lara's investment after 8 years. (3)

[9]

### QUESTION 6

Below is a sketch of the graph  $f(x) = 3^{x-2} - 1$



(a) Show working and give the co-ordinates of point A, the x intercept. (2)

(b) Show working and give the co-ordinates of point B, the y intercept. (2)

(c) Give the equation of the asymptote of  $f(x)$ . (1)

(d)  $g(x)$  is a reflection of  $f(x)$  about the y axis

(1) Give the equation of  $g(x)$ . (1)

(2) Give the equation of the asymptote of  $g(x)$ . (1)

(e) For which values of  $x$  will  $g(x)$  be increasing? (1)

(f) For which values of  $x$  will  $x \cdot f(x) > 0$ ? (2)

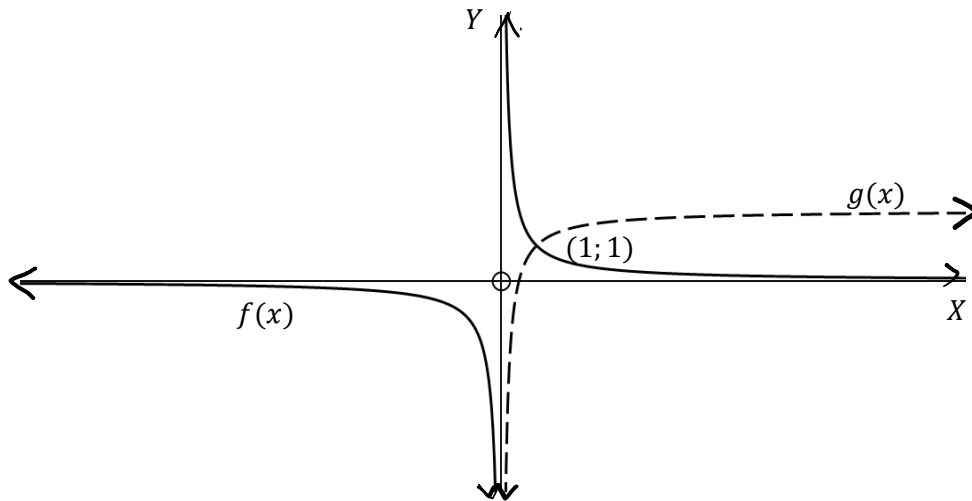
[10]

QUESTION 7 ( ANSWER ON THIS SHEET, hand in with Section B)

NAME: \_\_\_\_\_

MATHS TEACHER: \_\_\_\_\_

In the given sketch,  $f(x)$  and **part of**  $g(x)$  are given. The intersection point of the graphs shown is  $(1; 1)$ .  $f(x) = \frac{a}{x-p} + q$  and  $g(x) = \frac{b}{x-t} + s$ .



- (a) The asymptotes of  $f(x)$  are  $x = 0$  and  $y = 0$ . Give the equation of  $f(x)$ . (1)

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- (b) The asymptotes of  $g(x)$  are  $x = 0$  and  $y = 2$ .

(1) Complete the sketch of  $g(x)$ , showing any asymptotes on the sketch. (2)

(2) Give the equation of  $g(x)$ . (2)

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- (c)  $p(x)$  is formed by shifting  $f(x)$  1 unit to the left.

(1) Give the equation of  $p(x)$  (2)

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(2) Give the y-intercept of  $p(x)$  (1)

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- (d) Solve for  $x$  where  $g(x) \leq f(x)$ ,  $x \geq 0$  (2)

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[10]

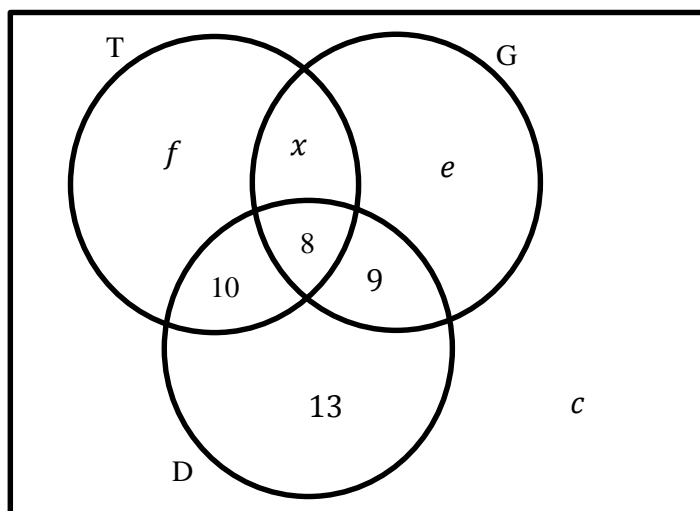
## QUESTION 8

A survey regarding their favourite magazine(s) was conducted among 84 high school girls. Three magazines, namely Glamour (G), Drum (D) and Teen Vogue (T) were used in the survey.

The results were as follows:

- 41 read Teen Vogue
- 34 read Glamour
- 40 read Drum
- 18 read Teen Vogue and Drum
- 8 read all three magazines
- 75 read at least one magazine
- $n(G \text{ and } D) = 17$

The Venn diagram shows the above information:

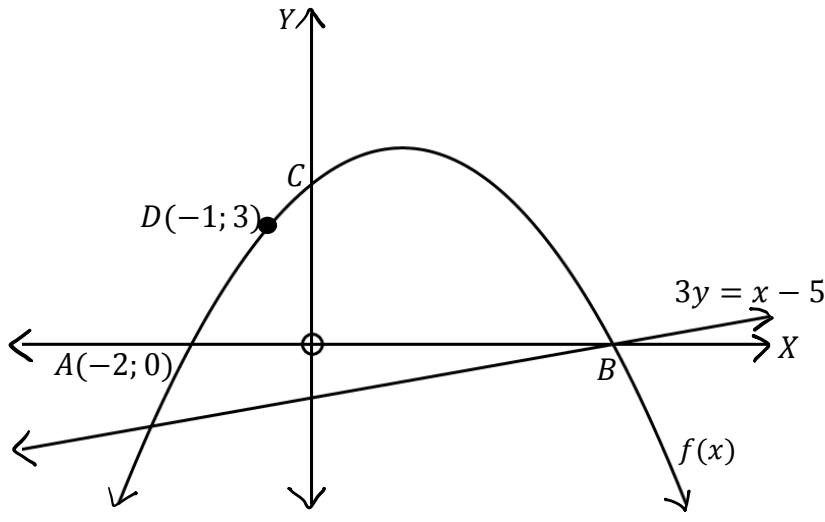


- (a) Give the value of  $c$ . (1)
- (b) Express  $f$  in terms of  $x$ . (1)
- (c) Express  $e$  in terms of  $x$ . (1)
- (d) Determine the values of  $e, f$  and  $x$ . (4)
- (e) Determine the probability that a randomly selected girl reads at least two of the three magazines. (2)

[9]

### QUESTION 9

The straight line  $3y = x - 5$  intersects  $f(x)$  at  $B$ . The points  $A(-2; 0)$  and  $B$  are the  $x$  intercepts of  $f(x)$ . Point  $D(-1; 3)$  is a point on  $f(x)$ .



- Determine the co-ordinates of  $B$ . (2)
- Determine the equation of  $f(x)$  in the form  $y = ax^2 + bx + c$ . (4)
- Give the co-ordinates of the turning point of  $f(x)$ . (2)
- Point  $E$  is a point on the straight line such that  $DE$  is parallel to the  $y$  axis. Determine the length of  $DE$ . (3)
- If  $h(x)$  is a reflection of  $3y = x - 5$  about the  $x$ -axis, give the equation of  $h(x)$  in the form  $y = \dots$  (1)

[12]

### QUESTION 10

Nokwanda invests a certain amount for 5 years. The investment earns interest at 12% p.a. compounded monthly for the full term. Nokwanda withdraws R2 000 from the account after 18 months. After 5 years the value of the investment is R 23 564. What amount did Nokwanda invest initially?

[5]

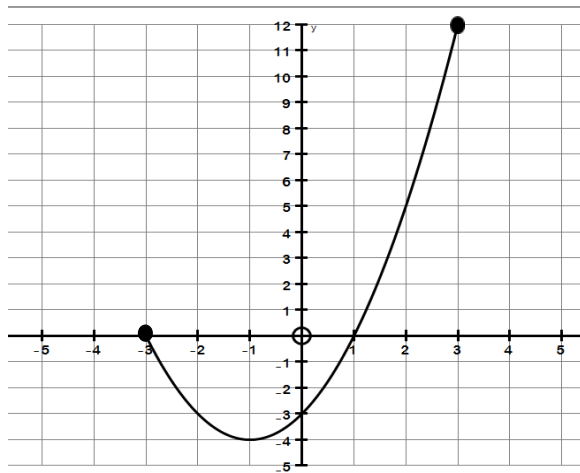
## QUESTION 11

(a) If  $2x^2 + px - 8 = (qx - 4)(x + k)$  find the values of  $p, q$  and  $k$ . (3)

(b) (1) Show that  $\sqrt{\frac{3^{x+1}-3^x}{3^{x-1}}} + 3 = 3$

(2) Hence solve  $\sqrt{\frac{3^{x+1}-3^x}{3^{x-1}}} + 3 = \left(\frac{1}{3}\right)^{x-2}$  (6)

(c) Given the sketch of  $y = ax^2 + bx - 3$  below:



(1) Give the range of the graph. (2)

(2) Give the values of  $x$  where  $f(x) < 0$  and  $f(x)$  is decreasing. (1)

(3) Without solving for  $a$  and  $b$ : (3)

Sketch the graph of  $y = ax^2 + bx - 8$ , for  $x \in [-3; 3]$ , on your own axes.

Show the co-ordinates of 3 points on your sketch.

[15]



**QUESTION 12**

(a) If  $\frac{h}{x} = 12$ ;  $\frac{h}{y} = 8$ ; and  $x + y = 5$ ; find the value of  $h$ . (4)

(b) An integer  $m$  is chosen at random from the list  $-9, -7, -5, -3, -1, 1, 3, 5, 7, 9$ . (3)  
The probability that  $m^4 > 100$  is ....

(c) The first number in a list of numbers is 4 and the second number is 3. The (6)  
third number is equal to the second minus the first. The fourth is equal to the  
third minus the second, and so on. The 2008<sup>th</sup> number is ?

[13]