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MATHEMATICS Year 11 TASK 3 Half-Yearly

2002



TRINITY GRAMMAR SCHOOL
MATHEMATICS DEPARTMENT



YEAR 11 2005 ASSESSMENT TASK 3

MATHEMATICS/MATHEMATICS EXTENSION 1 HALF YEARLY EXAMINATION

Time Allowed – Two And a half hours plus 5 minutes reading

WEIGHTING 25% towards final assessment

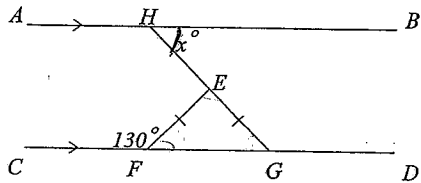
Outcomes referred to: P1, P2, P3, P4 and P5

INSTRUCTIONS:

1. Attempt ALL questions.
2. Show all necessary working in every question.
3. Begin each question on a new page.
4. Mark values are shown beside each part. Total marks 100.
5. Non-programmable silent Board of Studies approved calculators are permitted.
6. Place your name and your teacher's name on each sheet.
7. Additional writing paper may be obtained from a supervisor on request.

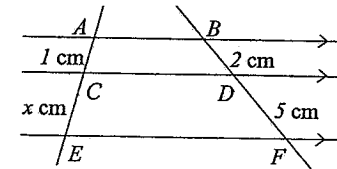
Question(1)

- a) Evaluate $\frac{13.2 + 67}{9.1 - 4.8}$ showing the full calculator answer then correct to 2 decimal places. (2 marks)
- b) Calculate $\sqrt[4]{19}$ correct to 3 significant figures. (1 mark)
- c) Express $6 \times \sqrt{\frac{1}{2}}$ as an entire surd in simplified form. (1 mark)
- d) Show that $\frac{1}{3 + \sqrt{3}} + \frac{1}{3 - \sqrt{3}}$ is a rational number. (3 marks)
- e) Simplify by removing the grouping symbols and collecting like terms $4(x^2 + 5x - 7) - 3(2x^2 - 7x + 1)$. (1 mark)
- f) In the diagram given below, $AB \parallel CD$ and $EG = EF$. $\angle CFE = 130^\circ$. Find the value of x , giving reasons. (2 marks)

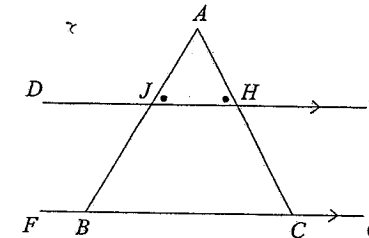


Question(2)

- a) Write $(-625)^{\frac{2}{3}}$ in its simplest surd form. (2 marks)
- b) Expand then Simplify $(2x + 3)(x^2 + 5x + 2)$. (2 marks)
- c) Factorise $a^3 - x^3$ (2 marks)
- d) The Kelvin and Celsius temperature scales are related by the equation $K = C + 273.15$. Find the temperature in degrees Kelvin if the temperature in degrees Celsius is 39.8 . (1 mark)
- e) Use the information in the diagram given below to find the value of x giving reasons. (1 mark)



- f) In the diagram given below, $DE \parallel FG$ and $\angle AHJ = \angle AJH$. Prove that $HC = JB$. (2 marks)



Question(3)

- a) Newton's Law of Universal Gravitation is given by the formula $F = \frac{GMm}{r^2}$. (2 marks)

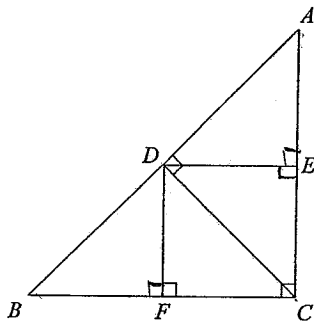
Find F (to the nearest whole number) if $G = 6.67 \times 10^{-11}$, $M = 6.6 \times 10^{21}$, $m = 3.5 \times 10^3$ and $r = 8.1 \times 10^6$.

- b) Factorise $x^2 + 15x + 50$. (1 mark)

- c) Factorise fully $10x^2 - 38x + 24$. (2 marks)

- d) Factorise fully $3x^2 - 27a^2$. (2 marks)

- e) Given that $AC = BC$, which triangles are congruent? State the reason (*SSS, SAS, AAS* or *RHS*). (3 marks)



Question(4)

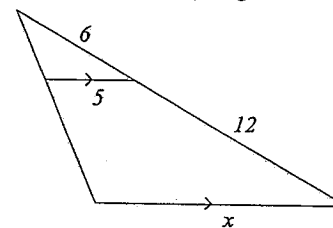
- a) Solve by $x^2 - 4x + 1 = 0$ by completing the square. (2 marks)

- b) Simplify $\frac{(2-4y)^2}{4y-2}$. (2 marks)

- c) Simplify $\frac{7}{x+3} + \frac{7}{x^2+5x+6}$. (3 marks)

- d) Simplify $\frac{2}{x+1} + \frac{1}{x-3}$. (2 marks)

- e) In the diagram given below, find the value of x giving reasons. (All lengths are in cm.) (1 mark)



Question(5)

a) Solve $7\sqrt{3}x + 2\sqrt{6} = \sqrt{3}x + 5\sqrt{6}$.

(2 marks)

b) Solve $\frac{4x}{5} - \frac{1}{4} = \frac{3}{5}$.

(2 marks)

c) Solve $\frac{5-x}{3} + \frac{2-x}{6} = 0$.

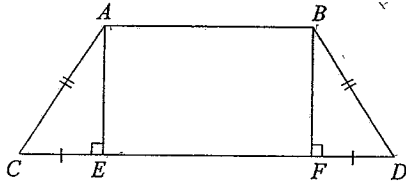
(2 marks)

d) Solve for x in terms of a : $ax + x = 3$.

(2 marks)

e) Use the information in the figure given below to prove that $AB \parallel CD$.

(2 marks)



Question(6)

a) Solve $x - \frac{4}{x} = 0$.

(2 marks)

b) Solve $x^2 = \frac{1}{3}(x + 1)$ by the quadratic formula.

(3 marks)

c) Make x the subject of $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$.

(2 marks)

d) Solve simultaneously and check your solutions
 $y = 2x + 1$
 $y = x^2 - 4x + 1$.

(3 marks)

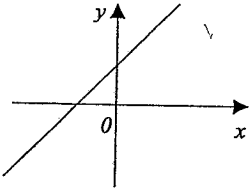
Question(7) —

- a) Solve simultaneously $4x + y = 5$ and $x - 3y = -2$. (2 marks)

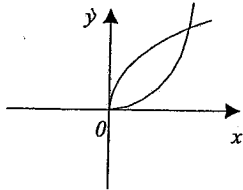
- b) Solve $\frac{x}{2} \leq x + \frac{2}{7}$ and graph the solution on the number line. (3 marks)

- c) Which of these figures defines a function? (1 mark)

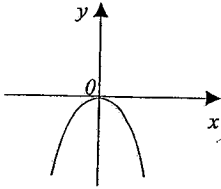
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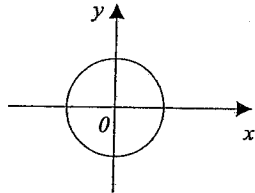
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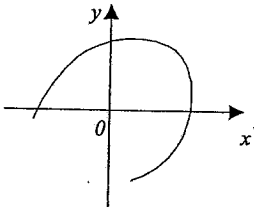
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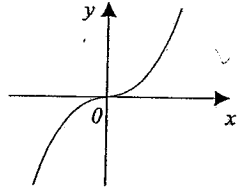
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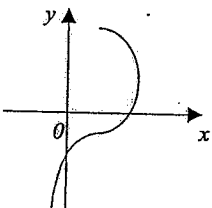
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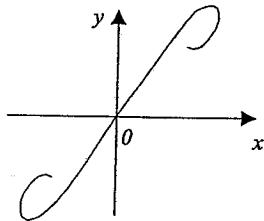
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g.



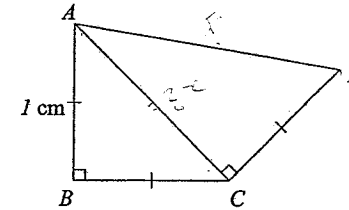
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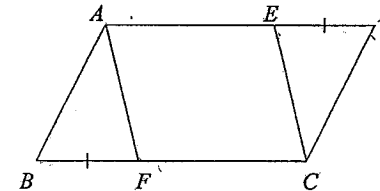
- d) For the function $f(x) = 3 - 4x$, find:
- the value of $f(-4)$ and $f(3)$; (2 marks)
 - the value of x at which $f(x) = -\frac{1}{4}$; (1 mark)
 - an expression for $f(c) + f(t)$. (1 mark)

Question(8)

- a) Prove that $AD = \sqrt{3}$ cm. (2 marks)



- b) $ABCD$ is a parallelogram. $BF = DE$.

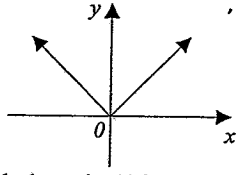


Prove that:

- $AECF$ is a parallelogram; (2 marks)
 - $\triangle ABF \cong \triangle CDE$. (2 marks)
- c) Consider the function $f(x) = |x - 1| + |x + 3|$:
- Find $f(-3)$. (1 mark)
 - Show that $f(x) = 4$ for $-3 \leq x \leq 1$. (2 marks)
- d) Find the domain of $y = x^2 + x + 1$. (1 mark)

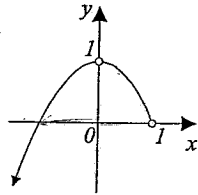
Question(9) —

- a) Find the domain (D) and the range (R) of the function below. (2 marks)

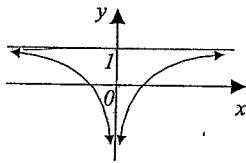


- b) Using a quarter page diagram, shade the region(s) in the XY -plane indicated by the inequality $y < |x + 2|$. (2 marks)

- c) Find the domain (D) and the range (R) of the function below. (2 marks)



- d) Find the domain (D) and the range (R) of the function below. (2 marks)



- e) Draw a sketch of the function $y = f(x)$ given that $f(x)$ has the following properties: (2 marks)

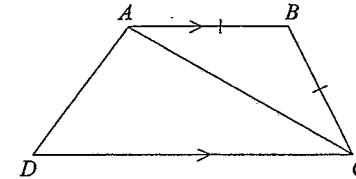
- $f(x)$ is positive for $x < 0$, negative for $x > 0$ and $f(0) = 0$,
- and $f(x)$ is decreasing everywhere,
- and $f(x)$ is continuous everywhere,
- and $f(x)$ is unbounded.

Question(10)

- a) Find the domain of $y = \sqrt{3x+6}$. (1 mark)

- b) Find the domain of $y = \frac{1}{2x-4}$. (1 mark)

- c) In the figure, $AB \parallel DC$ and $AB = BC$. Prove that AC bisects $\angle BCD$. (2 marks)



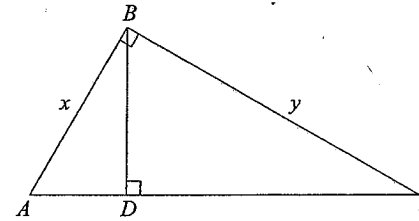
- d) Shade the region(s) in the XY -plane indicated by the inequality $x^2 + y^2 \leq 1$. (1 mark)

- e) Find the domain and range of $y = 3 - |x + 1|$. (3 marks)

Sketch the function clearly, using axes that take up a quarter of a page.

- f) In the diagram, if the area of $\triangle ABC = 1$ unit², express y in terms of x then (2 marks)

prove that the area of $\triangle ABD = \frac{x^4}{x^4+4}$ units².



END OF PAPER