IYGB GCE

Mathematics MP1

Advanced Level

Practice Paper F

Difficulty Rating: 3.49/1.1155

Time: 2 hours

Candidates may use any calculator allowed by the regulations of this examination.

Information for Candidates

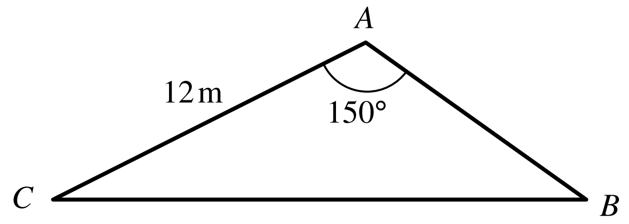
This practice paper follows closely the Pearson Edexcel Syllabus, suitable for first assessment Summer 2018.

The standard booklet "Mathematical Formulae and Statistical Tables" may be used.
Full marks may be obtained for answers to ALL questions.
The marks for the parts of questions are shown in round brackets, e.g. **(2)**.
There are 13 questions in this question paper.
The total mark for this paper is 100.

Advice to Candidates

You must ensure that your answers to parts of questions are clearly labelled.
You must show sufficient working to make your methods clear to the Examiner.
Answers without working may not gain full credit.
Non exact answers should be given to an appropriate degree of accuracy.
The examiner may refuse to mark any parts of questions if deemed not to be legible.

Question 1



The triangle ABC is such so that AC is 12 m and the angle CAB is $150°$.

a) Given that the area of the triangle ABC is 30 m^2, show that the length of AB is 10 m. **(2)**

b) Find the length of BC, giving the answer in m, correct to 2 decimal places. **(3)**

c) Calculate the smallest angle of the triangle ABC, giving the answer in degrees, correct to one decimal place. **(3)**

Question 2

a) Determine, in ascending powers of x, the first three terms in the binomial expansion of $(2-3x)^{10}$. **(3)**

b) Use the first three terms in the binomial expansion of $(2-3x)^{10}$, with a suitable value for x, to find an approximation for 1.97^{10}. **(3)**

c) Use the answer of part **(b)** to estimate, correct to 2 significant figures, the value of 3.94^{10}. **(2)**

Question 3

Prove that when the square of a positive odd integer is divided by 4 the remainder is always 1. **(2)**

Question 4

A cubic graph is defined by

$$f(x) \equiv x^3 - 3x^2 - 4x + 12, \; x \in \mathbb{R}.$$

a) Show, by using the factor theorem, that $(x-3)$ is a factor of $f(x)$ and hence factorize $f(x)$ into product of three linear factors. **(5)**

b) Sketch the graph of $f(x)$.
The sketch must include the coordinates of any points where the graph of $f(x)$ meets the coordinate axes. **(3)**

Another cubic graph is defined as

$$g(x) \equiv (x-2)(x-4)^2, \; x \in \mathbb{R}.$$

The two graphs meet at the points P and Q.

c) Determine the x coordinates of P and the x coordinates of Q. **(5)**

Question 5

It is given that $p = \log_6 25$ and $q = \log_6 2$.

Express in terms of p and q each of the following expressions

a) $\log_6 200$ **(2)**

b) $\log_6 3.2$ **(3)**

c) $\log_6 75$ **(4)**

Question 6

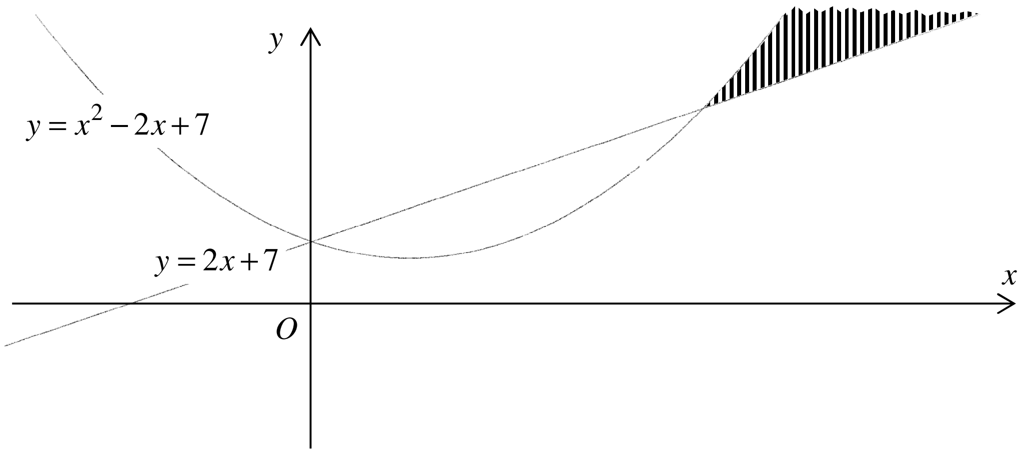
The quadratic equation

$$k\left(x^2+1\right)-3x+4=0,$$

where k is a non zero constant, has real roots.

Find the range of possible values of k. **(7)**

Question 7



The figure above shows the graphs of $y = x^2 - 2x + 7$ and $y = 2x + 7$.

Express the shaded region in the figure as a set of inequalities. **(3)**

Question 8

Given that θ is measured in degrees, solve the following trigonometric equation

$$\frac{4}{\tan^2 3\theta}+2=\frac{7}{\sin 3\theta}, \quad 0 \le \theta \le 180.$$ **(9)**

Question 9

$$f(x) = \left(x - 4 - \sqrt{3}\right)\left(x - 4 + \sqrt{3}\right), \ x \in \mathbb{R}.$$

a) Express $f(x)$ in the form …

i. … $f(x) = x^2 + bx + c$, where b and c are constants. **(3)**

ii. … $f(x) = (x + B)^2 + C$, where B and C are constants. **(2)**

b) Sketch the graph of the curve C with equation $y = f(x)$.

The sketch must include the coordinates of any points where the graph of C meets the coordinate axes, and the coordinates of the minimum point of C. **(4)**

Question 10

A circle has centre at $C(2,3)$ and radius 6.

a) Show that an equation of the circle is

$$x^2 + y^2 - 4x - 6y = 23.$$ **(3)**

The circle crosses the y axis at the points P and Q, where the y coordinate of P is positive.

b) Find the distance PQ, giving the answer as an exact simplified surd. **(4)**

The vertical straight line with equation $x = 1$ intersects the radii CP and CQ at the points R and S, respectively.

c) Determine the exact area of the trapezium $PQSR$. **(4)**

Question 11

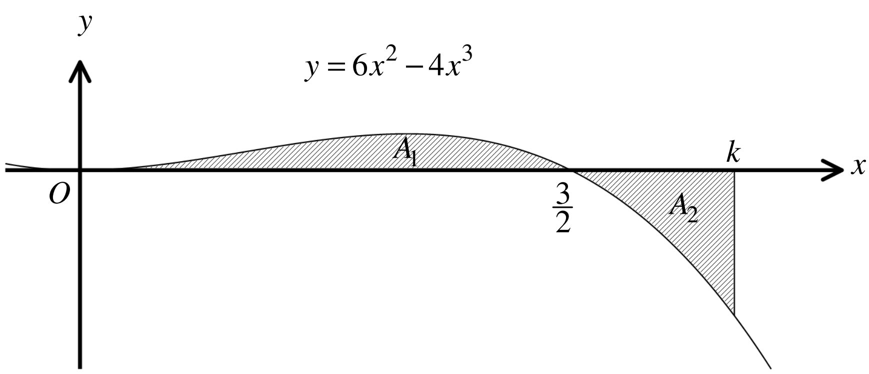
It is given that

$$x = \frac{\ln 3 - \ln 2}{1 + \ln 3}.$$

Show clearly that x is the solution of the equation

$$2 \times 3^x = 3 \times e^{-x}.$$ **(5)**

Question 12



The figure above shows the graph of the curve with equation

$$y = 6x^2 - 4x^3, \ x \in \mathbb{R}.$$

The curve meets x axis at the origin O and at the point $\left(\frac{3}{2}, 0\right)$.

The point $(k, 0)$, $k > \frac{3}{2}$ is such so that, the area A_1 of the region between the curve and the x axis for which $0 \le x \le \frac{3}{2}$, **is equal** to the area A_2 of the region between the curve and the x axis for which $\frac{3}{2} \le x \le k$.

Determine the value of k. **(7)**

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Question 13

The curve C has equation

$$y = 7\sqrt{x} - \frac{3}{\sqrt{x}}, \ \ x > 0$$

Show clearly that

$$y = 4x\left(x\frac{d^2y}{dx^2} + \frac{dy}{dx} \right). \qquad (7)$$