IYGB GCE

Core Mathematics C2

Advanced Subsidiary

Practice Paper Y

Difficulty Rating: 4.0600/2.0619

Time: 2 hours

Candidates may use any calculator allowed by the Regulations of the Joint Council for Qualifications.

Information for Candidates

This practice paper follows the Edexcel Syllabus.
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 10 questions in this question paper.
The total mark for this paper is 75.

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.

$C = \frac{1}{144}v^2 + 192v^{-1}$

$= \frac{v}{72} - \frac{192}{v^2}$

$\frac{v}{72} = \frac{192}{v^2}$

$\frac{v^3}{72} = 192$

$v^3 = 192 \times 72$

$v = \sqrt[3]{\quad}$

$= 24$ m/s ✓

Created by T. Madas

Question 1

On a given lorry journey the cost C, in pence per mile, is modelled by

$$C = \frac{192}{V} + \frac{V^2}{144}, \quad V > 6,$$

where V is the lorry's average speed in metres per second.

a) Find the speed, in metres per second, for which the cost, in pence per mile, is stationary. **(5)**

24 m/s

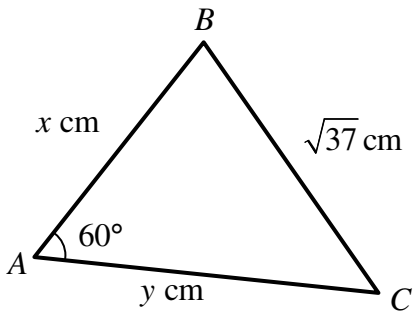
b) Justify that this value of the speed minimizes the cost. **(2)**

$P \propto v^2$, so minimum is where C is lowest ✓?

c) Hence determine the minimum cost of a 600 mile journey. **(2)**

$C = \frac{192}{24} + \frac{24^2}{144} = 12$ $\quad = 0.12 \times 600 = £72$ ✓

Question 2



not drawn accurately

The figure above shows a triangle ABC where AB is x cm, AC is y cm and BC is $\sqrt{37}$ cm. The angle BAC is $60°$.

$\sin 60 = \frac{\sqrt{3}}{2}$

$\cos 60 = \frac{1}{2}$

Given further that the area of the triangle ABC is $7\sqrt{3}$ cm^2, determine by solving two simultaneous equations the value of x and the value of y. **(8)**

$A = \frac{1}{2}ab\sin C$

$7\sqrt{3} = \frac{1}{2}xy\frac{\sqrt{3}}{2}$

$28 = xy$

$x = \frac{28}{y}$

$a^2 = b^2 + c^2 - 2bc\cos A$

$37 = x^2 + y^2 - xy$

$37 = \left(\frac{28}{y}\right)^2 + y^2 - 28$

$65 = \frac{784}{y^2} + y^2$

$65y^2 = 784 + y^4$

let $z = y^2$

$z^2 - 65z + 784 = 0$

$(z - 49)(z - 16) = 0$

$z = 49, 16$

$\therefore y = \pm 4, \pm 7$

can't be neg so $= 4, 7$

$x = \frac{28}{y}$

y	4	7
x	7	4

$(4, 7)$ or $(7, 4)$ ✓

Created by T. Madas

Question 3

Solve the following trigonometric equation in the range given.

$$4\tan\psi\sin\psi\cos\psi+4\tan\psi\cos\psi+1=0\,,\quad 0^\circ\le\psi<360^\circ\,. \qquad \textbf{(6)}$$

Question 4

A certain chemical industrial process is carried out at low temperatures.

The wastage cost £C during this chemical process and the average temperature T °C are related by the equation

$$C=\frac{36}{T}+\frac{2T^2}{3}\,,\ T>0\,.$$

Find the average temperature during which the wastage cost is increasing. **(6)**

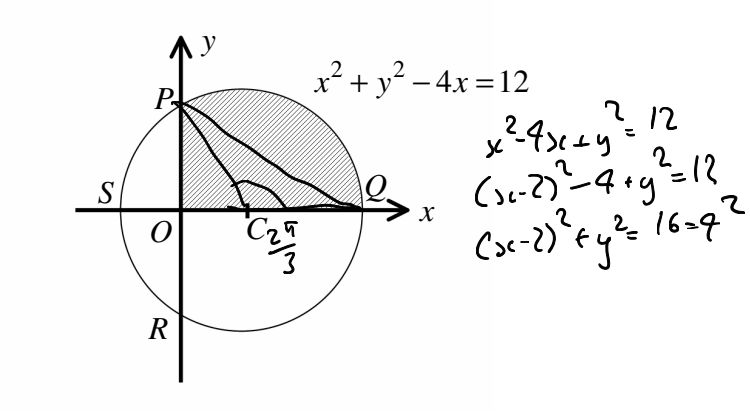
Question 5

$$f(x)=\left(4x+\frac{1}{kx}\right)^7,$$

where k is a positive constant.

Given the coefficient of x^3 in the binomial expansion of $f(x)$ is 21, determine the value of k. **(5)**

Question 6



The figure above shows the circle with equation

$$x^2 + y^2 - 4x = 12 .$$

The circle has centre at C and radius r

a) Find the coordinates of C and the value of r. **(3)**

The circle crosses the coordinate axes at the points P, Q, R and S, as shown in the figure above.

b) Show that …

i. … $\angle PCQ = \dfrac{2\pi}{3}$. **(3)**

ii. … the area of the shaded region bounded by the circle and the **positive sections** of the coordinate axes is

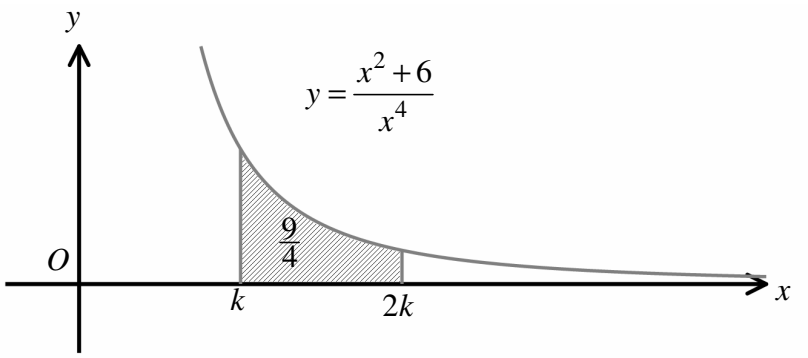
$$\frac{2}{3}\left(8\pi + 3\sqrt{3}\right).$$ **(5)**

Question 7

Solve the following logarithmic equation

$$\frac{\log_2 128 - \log_2 8}{\log_2 x} = \log_2 x .$$ **(6)**

Question 8



The figure above shows the graph of the curve with equations

$$y = \frac{x^2+6}{x^4}, \quad x > 0 .$$

The area of the region between the curve and the x axis for $k \le x \le 2k$, where k is a positive constant, is exactly $\frac{9}{4}$.

NC int

a) Show clearly that

$$9k^3 - 2k^2 - 7 = 0 . \qquad (\mathbf{9})$$

b) Hence find the value of k, showing further that there is no other value of k which satisfies the equation of part (b). $(\mathbf{4})$

Question 9

A pension contribution scheme is scheduled as follows.

A £1250 contribution is made at the **start** of every year.

The total money in the scheme at the end of every year is re-invested at a constant compound interest rate of 6% per annum.

$((1250\times1.06)+1250)\times1.06+1250=3979.50$ ✓

a) Show that at the start of the third year, after the annual contribution has been made, the amount in the pension scheme is £3979.50. **(3)**

b) Calculate the amount in the pension scheme at the start of the fortieth year, after the annual contribution is made. **(5)**

??? $=\dfrac{1250(1.06^{40}-1)}{1.06-1}$

Question 10

$-2x+30$, flip horiz, shift 2, left 30°

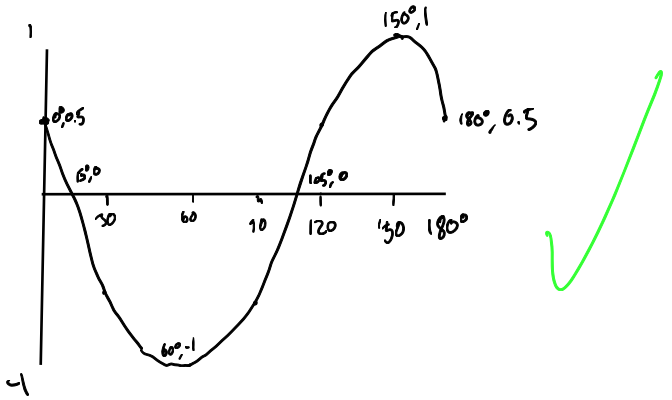
Sketch the graph of

$$y=\sin(30-2x)^\circ,\quad 0\le x\le 180.$$

The sketch must include the coordinates …

- … of any stationary points.
- … of any points where the graph meets the x axis.

(3)



✓