IYGB GCE

Mathematics FP3

Advanced Level

Practice Paper K

Difficulty Rating: 3.3067/1.4851

Time: 1 hour 30 minutes

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 9 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.

Question 1

$$I = \int_0^1 \sqrt{1+\sin x}\ \ dx$$

Use Simpson's rule with 4 equally spaced strips to estimate the approximate value of I, giving the answer correct to 3 decimal places $(\mathbf{5})$

Question 2

The position vectors of the points A, B and C are given below

$$\overrightarrow{OA} = -\mathbf{i}+2\mathbf{j}+2\mathbf{k}\ ,\ \ \overrightarrow{OB} = 3\mathbf{i}+4\mathbf{j}-\mathbf{k} \quad \text{and} \quad \overrightarrow{OC} = \mathbf{i}+4\mathbf{j}+\mathbf{k}\ .$$

a) Show that $\overrightarrow{OA}$, $\overrightarrow{OB}$ and $\overrightarrow{OC}$ are linearly dependent. $(\mathbf{4})$

b) Find the area of the triangle ABC. $(\mathbf{5})$

Question 3

Find the value of the following limit

$$\lim_{x\to 0}\left[\frac{\cos^2 3x-1}{x^2}\right]. \qquad (\mathbf{6})$$

Question 4

$$\frac{dy}{dx} = \sin\left(x^2+y^2\right), \quad y(1)=2\ .$$

Use, in the standard notation, the approximation

$$y_n' \approx \frac{y_{n+1}-y_n}{h}\ ,$$

with $h=0.01$, to find, correct to 4 decimal places, the value of y at $x=1.03$. $(\mathbf{6})$

Question 5

An ellipse has equation

$$x^2 - 8x + 4y^2 + 12 = 0 .$$

a) Determine the coordinates of the foci and the equations of the directrices of the ellipse. **(6)**

A straight line with positive gradient passes through the origin O and t**ouches** the ellipse at the point A.

b) Find the coordinates of A. **(7)**

Question 6

$$y = e^{2x} \sin x , \ x \in \mathbb{R} .$$

(7)

Use the Leibniz rule to find a simplified expression for $\frac{d^6 y}{dx^6}$.

Question 7

$$x\frac{d^2 y}{dx^2} + (6x + 2)\frac{dy}{dx} + 9xy = 27x - 6y .$$

Use the substitution $u = xy$, where u is a function of x, to find a general solution of the above differential equation. **(12)**

Question 8

Find the set of values of x, that satisfy the following inequality.

$$\left|\frac{(x-1)(x+4)}{x^2+4}\right|<1. \qquad \textbf{(8)}$$

Question 9

Use the substitution $t=\tan\left(\frac{x}{2}\right)$ to find the exact value of

$$\int_0^{\frac{\pi}{2}} \frac{3\sqrt{3}}{2-\cos x}\,dx. \qquad \textbf{(9)}$$
