Pearson Edexcel International Advanced Level

Monday 1 June 2026

Afternoon (Time: 1 hour 30 minutes)

Paper reference **WFM02/01A**

Mathematics

International Advanced Subsidiary/Advanced Level
Further Pure Mathematics F2
Question paper

You must have: Answer book (sent separately)
Do not return this question paper with the answer book

Turn over

©2026 Pearson Education Ltd.
P:1/1/1/

P 7 9 5 0 4 A

Pearson

1. **In this question you must show all stages of your working.**
Solutions relying entirely on calculator technology are not acceptable.

Use algebra to determine the values of x for which

$$\frac{2}{x+3} < 1 - \frac{3}{x-2}$$

(7)

(Total for Question 1 is 7 marks)

---

2. (a) Show that, for $r \geqslant 0$

$$\frac{1}{(r+1)!} - \frac{1}{(r+2)!} \equiv \frac{r+1}{(r+2)!}$$

(2)

(b) Hence use the method of differences to determine

$$\sum_{r=1}^{n} \frac{r+1}{(r+2)!}$$

giving the answer as a single fraction.

(3)

(c) Using the answer to part (b) and making your method clear, determine the value of

$$\sum_{r=4}^{10} \frac{3r+3}{(r+2)!}$$

giving the answer to 3 significant figures.

(2)

(Total for Question 2 is 7 marks)

---

3. Given that

$$y = (1 - 2x)^2 \ln(1 - 2x) \qquad x < \frac{1}{2}$$

(a) show that

$$\frac{\mathrm{d}^3 y}{\mathrm{d}x^3} = \frac{a}{1 - 2x}$$

where a is an integer to be determined.

(5)

(b) Hence determine the Maclaurin series expansion for y in ascending powers of x, up to and including the term in x^4, giving each coefficient in simplest form.

(5)

(Total for Question 3 is 10 marks)

---

4. (a) Determine the general solution of the differential equation

$$4\frac{\mathrm{d}^2 y}{\mathrm{d}x^2} - 4\frac{\mathrm{d}y}{\mathrm{d}x} + y = 2\mathrm{e}^{\frac{1}{2}x}$$

(7)

Given that $y = 1$ and $\dfrac{\mathrm{d}y}{\mathrm{d}x} = \mathrm{e}^{\frac{1}{2}}$ at $x = 0$

(b) determine the particular solution of the differential equation.

(4)

(Total for Question 4 is 11 marks)

---

5. The transformation T from the z-plane, where $z = x + \mathrm{i}y$, to the w-plane, where $w = u + \mathrm{i}v$, is given by

$$w = 2 - \frac{3}{z + \mathrm{i}} \qquad z \neq -\mathrm{i}$$

The half-line in the z-plane with equation $\arg z = \dfrac{\pi}{4}$ is mapped by T onto a circle C in the w-plane.

(a) Determine the equation of C in the form

$$(u - a)^2 + (v - b)^2 = k$$

where a, b and k are constants.

(7)

(b) Hence, or otherwise, determine

(i) the radius of C

(ii) the coordinates of the centre of C

(2)

(Total for Question 5 is 9 marks)

---

6. (a) Given that $z = \cos\theta + \mathrm{i}\sin\theta$, show that

(i) $\dfrac{1}{2}\left(z + \dfrac{1}{z}\right) = \cos\theta$

(ii) $\dfrac{1}{2\mathrm{i}}\left(z - \dfrac{1}{z}\right) = \sin\theta$

(2)

(b) Hence show that

$$\sin^3\theta\cos^4\theta \equiv a\sin 7\theta + b\sin 5\theta + c\sin 3\theta + d\sin\theta$$

where a, b, c and d are constants to be determined.

(5)

(c) Use the result from part (b) and algebraic integration to determine the exact value of

$$\int_0^{\frac{\pi}{2}} \sin^3\theta\cos^4\theta \, \mathrm{d}\theta$$

(4)

(Total for Question 6 is 11 marks)

---

7. (a) Show that $e^{k\sin^2 x}$ is an integrating factor of the differential equation

$$\sec x \frac{dy}{dx} - 2y\sin x = e^{x + \sin^2 x}$$

where k is a constant to be determined.

(2)

(b) Hence find the general solution of the differential equation.

(6)

Given that $y = 2$ at $x = 0$

(c) determine the particular solution of the differential equation.

(2)

(Total for Question 7 is 10 marks)

8.

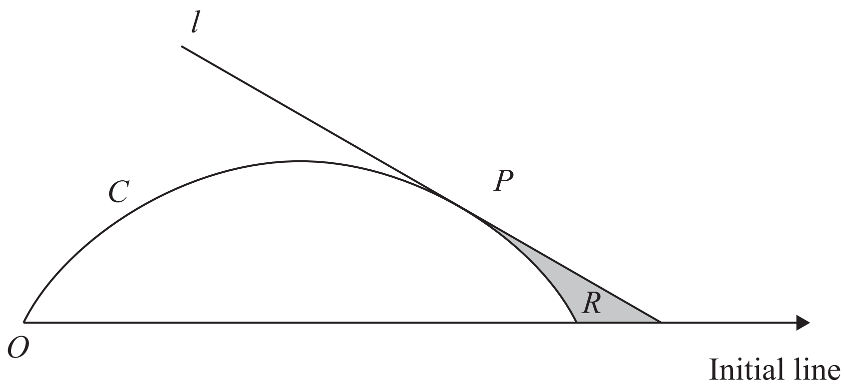

Figure 1

Figure 1 shows a sketch of the curve C with polar equation

$$r = 2\cos\left(\theta + \frac{\pi}{6}\right) \qquad 0 \leqslant \theta \leqslant \frac{\pi}{3}$$

and the line segment l with polar equation

$$r = \sec\left(\theta - \frac{\pi}{3}\right) \qquad 0 \leqslant \theta \leqslant \frac{\pi}{3}$$

The line l is a tangent to C at the point P, as shown in Figure 1.

(a) By solving simultaneous equations and using the identity $\cos\theta \equiv \sin\left(\theta + \frac{\pi}{2}\right)$

show that the polar coordinates of P are $\left(\sqrt{2}, \frac{\pi}{12}\right)$

(3)

The region R, shown shaded in Figure 1, is bounded by C, l and the initial line.

(b) Use algebraic integration to show that the area of R is

$$a\sqrt{3} + b + c\pi$$

where a, b and c are rational numbers to be determined.

$$\left(\text{You may use } \sin\frac{\pi}{12} = \frac{\sqrt{6} - \sqrt{2}}{4} \text{ and } \cos\frac{\pi}{12} = \frac{\sqrt{6} + \sqrt{2}}{4} \text{ without justification.}\right)$$

(7)

(Total for Question 8 is 10 marks)

TOTAL FOR PAPER IS 75 MARKS

BLANK PAGE

BLANK PAGE