

IGCSE Edexcel Past Papers

# FURTHER PURE MATHEMATICS

Paper 2

2015 — Winter 2019

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1 - (4PM0-S 2016-Paper 2-Q6) - INTERSECTION POINT, INTEGRATION

- (a) Use algebra to find the coordinates of the points of intersection of the curve with equation  $y = x^2 + 2x - 6$  and the line with equation  $y = 5x + 4$  (5)
- (b) Use algebraic integration to find the exact area of the finite region bounded by the curve and the line. (5)

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2 - (4PM0-W 2016-Paper 2-Q3) - INTERSECTION POINT

Solve the equations

$$3y = 12 - 4x$$

$$(x + 1)^2 + (y - 2)^2 = 4$$

(7)

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3 - (4PM0-S 2017-Paper 2-Q2) - INTERSECTION POINT

Solve the equations

$$y = x^2 - 6x + 5$$

$$y + x = 11$$

(5)

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4 - (4PM0-S 2018-Paper 2-Q4) - INTERSECTION POINT, CARTESIAN COORDINATES

(a) Find the exact value of the root of the equation  $e^{3x} = 8$

Give your answer in the form  $\ln a$ , where  $a$  is an integer.

(2)

The curve  $C_1$  has equation  $y = 2e^{3x}$  and the curve  $C_2$  has equation  $y = (e^{3x} - 4)^2$

The curves  $C_1$  and  $C_2$  intersect at the points  $P$  and  $Q$ .

(b) Use algebra to find the exact coordinates of the points  $P$  and  $Q$ .

(5)

(c) Find, to 3 decimal places, the length of  $PQ$ .

(2)

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# ANSWERS

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## 1 - (4PM0-S 2016-Paper 2-Q6) - INTERSECTION POINT, INTEGRATION

(a)	$5x + 4 = x^2 + 2x - 6$ $x^2 - 3x - 10 (= 0)$ $(x - 5)(x + 2) (= 0)$ $x = 5 \quad y = 29; \quad x = -2 \quad y = -6$	M1 A1  M1A1A1 (5)
(b)	$\int_{-2}^5 \left( (5x + 4) - (x^2 + 2x - 6) \right) dx \quad \text{(either way round)}$ $\int_{-2}^5 (-x^2 + 3x + 10) dx$ $\left[ -\frac{1}{3}x^3 + \frac{3}{2}x^2 + 10x \right]_{-2}^5 \quad \text{(Correct integration of a function, either way round or correct integration of two sep functions)}$ $= \left( -\frac{125}{3} + \frac{75}{2} + 50 \right) - \left( \frac{8}{3} + 6 - 20 \right)$ $= 57\frac{1}{6}, \frac{343}{6} \quad \text{must be positive}$	M1  M1A1 dM1 A1cao (5) [10]

## 2 - (4PM0-W 2016-Paper 2-Q3) - INTERSECTION POINT

$3y = 12 - 4x \Rightarrow y = 4 - \frac{4}{3}x \quad \text{OR} \quad 4x = 12 - 3y \Rightarrow x = 3 - \frac{3}{4}y$	$\left( 3 - \frac{3}{4}y + 1 \right)^2 + (y - 2)^2 = 4$
$(x + 1)^2 + \left( 4 - \frac{4}{3}x - 2 \right)^2 = 4$	$\Rightarrow 25y^2 - 160y + 256 = 0 \quad 3\text{TQ}$
$\Rightarrow 25x^2 - 30x + 9 = 0 \quad 3\text{TQ}$	$(5y - 16)(5y - 16) = 0 \Rightarrow y = \frac{16}{5}$
$(5x - 3)(5x - 3) = 0 \Rightarrow x = \frac{3}{5}$	$x = 3 - \frac{3}{4} \times \frac{16}{5} = \frac{3}{5}$
$y = 4 - \frac{4}{3} \times \frac{3}{5} = \frac{16}{5}$	

## 3 - (4PM0-S 2017-Paper 2-Q2) - INTERSECTION POINT

$x^2 - 6x + 5 = 11 - x$		M1
$x^2 - 5x - 6 (=0)$	OR $y^2 - 17y + 60 (=0)$	A1
$(x-6)(x+1) (=0)$	$(y-12)(y-5) (=0)$	dM1
$x = 6, y = 5$		A1
$x = -1, y = 12$		A1 [5]

## 4 - (4PM0-S 2018-Paper 2-Q4) - INTERSECTION POINT, CARTESIAN COORDINATES

(a)	$3x = \ln 8$ or $x = \frac{1}{3} \ln 8$ or $\log_e 8 = 3x$ or $e^x = 2$ or $e^x = \sqrt[3]{8}$ or $e^x = 8^{\frac{1}{3}}$	M1
	$x = \ln 2$	A1 (2)
(b)	$2e^{3x} = (e^{3x} - 4)^2$ or $y = \left(\frac{y}{2} - 4\right)^2$	M1
	$0 = (e^{3x})^2 - 10e^{3x} + 16$ or $y^2 - 20y + 64 = 0$	A1
	$(e^{3x} - 8)(e^{3x} - 2) = 0$ or $(y - 16)(y - 4) = 0$	
	$e^{3x} = 8$ $x = \frac{1}{3} \ln 8 = \ln 2$ or $y = 16$	M1
	$e^{3x} = 2$ $x = \frac{1}{3} \ln 2$ or $y = 4$	A1
	$(\ln 2, 16)$ or $\left(\frac{1}{3} \ln 2, 4\right)$	A1 (5)
(c)	Length $PQ = \sqrt{\left(\ln 2 - \frac{1}{3} \ln 2\right)^2 + 12^2} = 12.0088... = 12.009$	M1, A1 (2)
		[9]