Practice Paper A .

## CORETWO

## crashMATHS

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Duration	1 HOUR & 30 MINUTES		
Total Marks Available	75 MARKS		

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	Siven that $\cos \theta = \frac{1}{5}$ , find the exact value of	
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	(b) $\tan \theta$	(2)
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2 (a) In ascending powers of a, find the first four terms in the binomial expansion of

$$(2a+b)^8 (5)$$

- (b) Show that  $\left(a + \frac{b}{2}\right)^8 = k\left(2a + b\right)^8$ , where k is a constant to be found. (1)
- (c) Hence, show that

$$\frac{\left(a+\frac{b}{2}\right)^8}{4ab} = \frac{1}{4}a^7b^{-1} + a^6 + \frac{7}{4}a^5b + \frac{7}{4}a^4b^2 + \dots$$
 (3)



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3 The curve C has the equation

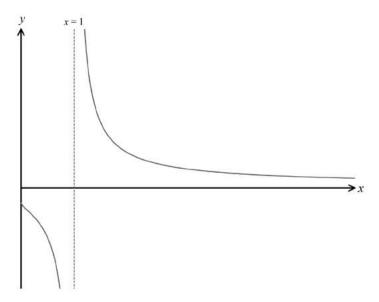
$$y = \frac{1 + \sqrt{x}}{x - 1}$$

(a) Use the trapezium rule with three **equally spaced** intervals to find an approximation for

$$\int_2^5 y \, \mathrm{d}x$$

(6)

The diagram below shows a sketch of the curve C for x > 0.



(b) Using the graph, does your approximation in part (a) overestimate or underestimate the value of

$$\int_{2}^{5} y \, \mathrm{d}x$$

Explain your answer.

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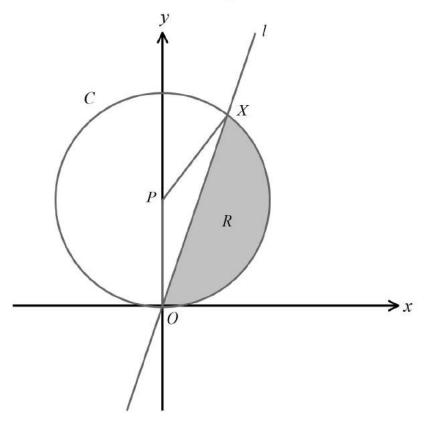
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4 The diagram below shows a sketch of the circle C and the line I.



The circle C has centre P(0,5) and l has equation y = 3x.

C and l intersect at the point X.

- (a) Find the equation of C.
- (b) Find the coordinates of the point X. (4)

Given that the angle  $OPX = \theta^{\circ}$ ,

- (c) Find the value of  $\cos \theta$ . (2)
- (d) Calculate the area of the triangle OPX. (2)
- (e) Work out the area of the shaded region R.

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5	The price of a car depreciates by 1.2% each year, such that the decrease in its price	
	follows a geometric progression. The car is initially priced at £34 000.	
	(a) State the common ratio of this geometric progression.	(1)
	(b) Work out the price of the car after four years.	(2)
	The company will stop reducing the price of the car in the Year $N$ so that it does not	
	fall below £30 000.	
	(c) Find $N$ .	(3)
	Given that 150 individuals purchase the car in Year 1, 250 in Year 2, 350 in Year 3	
	and so on, work out	
	(d) (i) the number of individuals that purchase the car in the Year $N$ .	(2)
	(ii) if the company had more takings in Year 1 or Year $N$ .	(4)
	(e) Hence, comment on the effectiveness of the company reducing the price of car.	(1)



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6 Given that a and b are positive constants, solve the simultaneous equations	
a = 3b	
$\log_3 a + \log_9 b = 2$	
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Give your answers as exact values.	(7)
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	7	(a) Find the derivative of $y = x^3 - 3x^2 + 27x - 3$	(2)
		(b) Show that the curve is an increasing function for all $x$ .	(3)
		(c) Show also that the curve has no stationary points.	(3)
		(d) Hence, sketch the curve $y = x^3 - 3x^2 + 27x - 3$ .	
		On your sketch, you should show clearly any coordinates at which the curve crosses	
			(2)
		or meets the y axis.	(2)
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8	(a)	Show	that
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$$\sin\theta - \frac{1}{\sin\theta} \equiv -\frac{\cos\theta}{\tan\theta} \tag{3}$$

(b) Hence, or otherwise, solve for  $0 \le x \le 2\pi$ ,

$$\sin^2 2x \left(\cos^2 2x\right)^{-1} = \frac{2}{\cos 2x} \left(\sin 2x - \frac{1}{\sin 2x}\right) + \tan^2 2x - 4 \tag{7}$$

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