1. *(a)* Express $\dfrac{36}{\sqrt{6}}$ in the form $k\sqrt{6}$. **(2)**

(b) Express $64^{-\frac{1}{3}}$ as an exact fraction in its simplest form. **(2)**

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3. Differentiate with respect to x

$$\frac{4x^2 - 3}{2\sqrt{x}}.$$ **(5)**

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4. *(a)* Solve the inequality

$$x^2 - 7x > -12.$$ **(3)**

(b) Find the set of values of x which satisfy both of the following inequalities:

$$3x - 2 < x + 3$$

$$x^2 - 7x > -12$$ **(3)**

---

6. *(a)* By completing the square, find in terms of the constant k the roots of the equation

$$x^2 + 4kx - k = 0.$$ **(4)**

(b) Hence find the set of values of k for which the equation has no real roots. **(4)**

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7. *(a)* Describe fully a single transformation that maps the graph of $y = \frac{1}{x}$ onto the graph of $y = \frac{5}{x}$. **(2)**

(b) Sketch the graph of $y = \frac{5}{x}$ and write down the equations of any asymptotes. **(3)**

(c) Find the values of the constant c for which the straight line $y = c - 5x$ is a tangent to the curve $y = \frac{5}{x}$. **(4)**

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8. The points A and B have coordinates (9, 7) and (7, 4) respectively.

(a) Find an equation for the straight line l which passes through A and B.
Give your answer in the form $ax + by + c = 0$, where a, b and c are integers. **(4)**

The straight line m has gradient 8 and passes through the origin, O.

(b) Write down an equation for m. **(1)**

The lines l and m intersect at the point L.

(c) Show that $OA = OL$. **(5)**

Turn over

9.

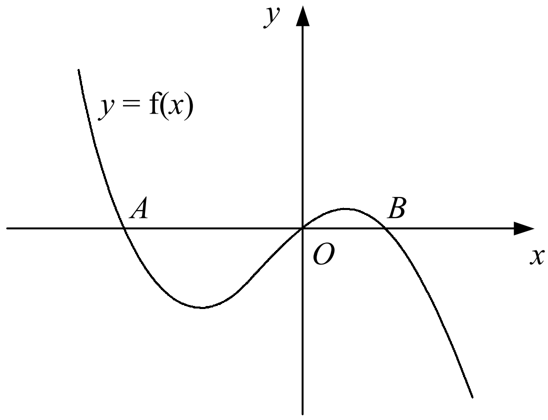

Figure 1 shows the curve with equation $y = f(x)$ which crosses the x-axis at the origin and at the points A and B.

Given that

$$f'(x) = 12 - 8x - 6x^2,$$

(a) find an expression for y in terms of x, **(5)**

(b) show that $AB = k\sqrt{7}$, where k is an integer to be found. **(6)**

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10. A curve has the equation $y = x + \dfrac{6}{x}$, $x \neq 0$.

The point P on the curve has x-coordinate 1.

(a) Show that the gradient of the curve at P is -2. **(3)**

(b) Find an equation for the normal to the curve at P, giving your answer in the form $y = mx + c$. **(4)**

(c) Find the coordinates of the point where the normal to the curve at P intersects the curve again. **(4)**

Paper A – Answers

1. *(a)* $= \frac{36}{\sqrt{6}} \times \frac{\sqrt{6}}{\sqrt{6}} = 6\sqrt{6}$ M1 A1

(b) $= \frac{1}{\sqrt[3]{64}} = \frac{1}{4}$ M1 A1 **(4)**

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3. $\frac{4x^2 - 3}{2\sqrt{x}} = 2x^{\frac{3}{2}} - \frac{3}{2}x^{-\frac{1}{2}}$ M1 A1

$\frac{\mathrm{d}}{\mathrm{d}x}(3x^{\frac{3}{2}} - \frac{1}{2}x^{-\frac{1}{2}}) = \frac{9}{2}x^{\frac{1}{2}} + \frac{3}{4}x^{-\frac{3}{2}}$ M1 A2 **(5)**

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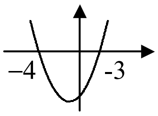
4. *(a)* $x^2 - 7x + 12 > 0$

$(x - 3)(x - 4) > 0$ M1



M1

$x < -4$ or $x > -3$ A1

(b) $3x - 2 < x + 3 \Rightarrow 2x < 5$ M1

$x < \frac{5}{2}$ A1

both satisfied when $x < -4$ – A1 **(6)**

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5. *(a)* B1

M1 A1

(b)

M1

M1

A1

A1 **(7)**

---

6. *(a)* $(x + 2k)^2 - (2k)^2 - k = 0$ M1

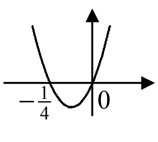
$(x + 2k)^2 = 4k^2 + k$ A1

$x + 2k = \pm\sqrt{4k^2 + k}$ M1

$x = -2k \pm \sqrt{4k^2 + k}$ A1

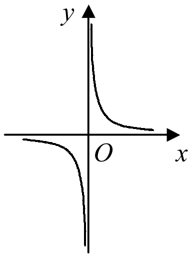
(b) no real roots if $4k^2 + k < 0$ M1

$k(4k + 1) < 0$, critical values: $-\frac{1}{4}, 0$ A1



M1

$\therefore\ -\frac{1}{4} < k < 0$ A1 **(8)**

7.	*(a)*	stretch by factor of 5 in y-direction about x-axis or stretch by factor of 5 in x-direction about y-axis	B2	
	(b)	 	B2	
		asymptotes: $x = 0$ and $y = 0$	B1	
	(c)	$\frac{5}{x} = c - 5x$		
		$5 = cx - 5x^2$	M1	
		$5x^2 - cx + 5 = 0$		
		tangent $\therefore$ equal roots, $b^2 - 4ac = 0$		
		$(-c)^2 - (4 \times 5 \times 5) = 0$	M1 A1	
		$c^2 = 100, \quad c = \pm 10$	A1	**(9)**
8.	*(a)*	grad $= \frac{7-4}{9-7} = \frac{3}{2}$	M1 A1	
		$\therefore \; y - 4 = \frac{3}{2}(x - 7)$	M1	
		$2y - 8 = 3x - 21$		
		$3x - 2y - 13 = 0$	A1	
	(b)	$y = 8x$	B1	
	(c)	at R, $\quad 3x - 2(8x) - 13 = 0$		
		$x = -1 \qquad \therefore R\,(-1, -8)$	M1 A1	
		$OP = \sqrt{7^2 + 4^2} = \sqrt{\quad +16} = \sqrt{65}$	M1 A1	
		$OR = \sqrt{(-1)^2 + (-8)^2} = \sqrt{\quad +64} = \sqrt{65} \quad \therefore OP = OR$	A1	**(10)**
9.	*(a)*	$y = \int (12 - 8x - 6x^2)\,\mathrm{d}x, \quad y = 12x - 4x^2 - 2x^3 + c$	M1 A2	
		$(0, 0) \;\; \therefore c = 0$	M1	
		$y = 12x - 4x^2 - 2x^3$	A1	
	(b)	$12x - 4x^2 - 2x^3 = 0, \;\; 2x(6 - 2x - x^2) = 0$	M1	
		$2x = 0$ (at O) or $6 - 2x - x^2 = 0$		
		at A, B: $\quad x = \frac{2 \pm \sqrt{4+24}}{-2} = \frac{2 \pm 2\sqrt{7}}{-2} = -1 \pm \sqrt{7}$	M2 A1	
		$A\,(-1 - \sqrt{7}, 0), B\,(-1 + \sqrt{7}, 0)$		
		$\therefore \; AB = (-1 + \sqrt{7}) - (-1 - \sqrt{7}) = 2\sqrt{7} \qquad [\, k = 2 \,]$	M1 A1	**(11)**
10.	*(a)*	$\frac{\mathrm{d}y}{\mathrm{d}x} = 1 - 3x^{-2}$	M1 A1	
		grad $= 1 - 3(1)^{-2} = 1 - 3 = -2$	A1	
	(b)	$x = 1 \;\; \therefore y = 4$		
		grad $= \frac{-1}{-2} = \frac{1}{2}$	M1 A1	
		$\therefore \; y - 4 = \frac{1}{2}(x - 1)$	M1	
		$y = \frac{1}{2}x + \frac{75}{2}$	A1	
	(c)	$x + \frac{3}{x} = \frac{1}{2}x + \frac{7}{2}$		
		$2x^2 + 6 = x^2 + 7x$	M1	
		$x^2 - 7x + 6 = 0, \quad (x - 1)(x - 6) = 0$	M1	
		$x = 1$ (at P), 6	A1	
		$\therefore \; (6, \; 6\frac{1}{2})$	A1	**(11)**

Total **(75)**

Performance Record – C1 Paper A

Question no.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	Total
Topic(s)	surds, indices	AP	diff.	inequals	recur. relation	compl. square	transform., rep. root	straight lines	integr.	diff., normal	
Marks	4	4	5	6	7	8	9	10	11	11	75
Student											