Integration Exam Questions (From OCR 4722 unless otherwise stated)

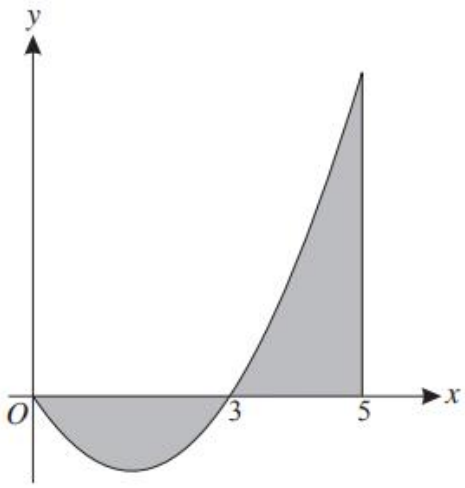
Q1, (Jun 2007, Q6)

(a) **(i)** Find $\int x(x^2 - 4)\,dx$. [3]

(ii) Hence evaluate $\int_1^6 x(x^2 - 4)\,dx$. [2]

(b) Find $\int \frac{6}{x^3}\,dx$. [3]

Q2, (Jan 2008, Q7)



The diagram shows part of the curve $y = x^2 - 3x$ and the line $x = 5$.

(i) Explain why $\int_0^5 (x^2 - 3x)\,dx$ does not give the total area of the regions shaded in the diagram. [1]

(ii) Use integration to find the exact total area of the shaded regions. [7]

Q3, (Jan 2009, Q1)

Find

(i) $\int (x^3 + 8x - 5)\,dx$, **[3]**

(ii) $\int 12\sqrt{x}\,dx$. **[3]**

Q4, (Jun 2011, Q2)

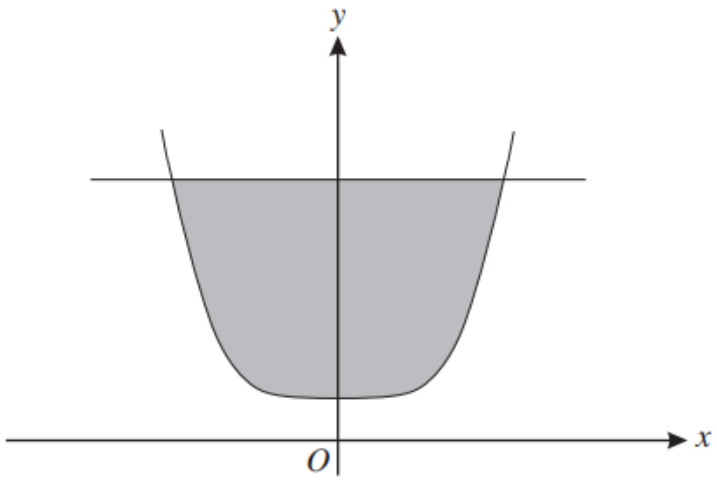
(i) Find $\int \left(6x^{\frac{1}{2}} - 1\right) \mathrm{d}x$. **[3]**

(ii) Hence find the equation of the curve for which $\frac{\mathrm{d}y}{\mathrm{d}x} = 6x^{\frac{1}{2}} - 1$ and which passes through the point (4, 17). **[3]**

Q5, (Jun 2015, Q5)

A curve has an equation which satisfies $\frac{\mathrm{d}^2y}{\mathrm{d}x^2} = 3x^{-\frac{1}{2}}$ for all positive values of x. The point $P(4, 1)$ lies on the curve, and the gradient of the curve at P is 5. Find the equation of the curve. **[7]**

Q6, (Jan 2009, Q4)



The diagram shows the curve $y = x^4 + 3$ and the line $y = 19$ which intersect at $(-2, 19)$ and $(2, 19)$. Use integration to find the exact area of the shaded region enclosed by the curve and the line. **[7]**

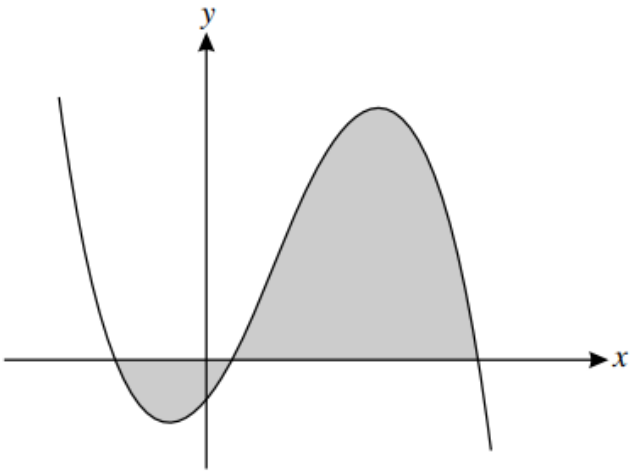
Q7, (OCR H230/01, Practice Papers Set 1, Q6)

(i) Find $\int (x^3 - x^2 - 2x)\mathrm{d}x$. **[3]**

(ii) **In this question you must show detailed reasoning.**

Find the area enclosed by the curve $y = x^3 - x^2 - 2x$ and the positive x-axis. **[4]**

Q8, (Jan 2011, Q9)



The diagram shows the curve $y = f(x)$, where $f(x) = -4x^3 + 9x^2 + 10x - 3$.

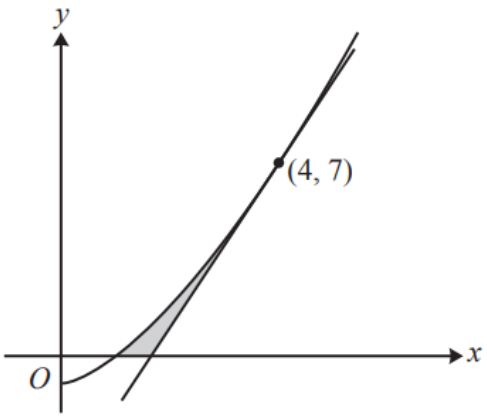
(i) Verify that the curve crosses the x-axis at $(3, 0)$ and hence state a factor of $f(x)$. **[2]**

(ii) Express $f(x)$ as the product of a linear factor and a quadratic factor. **[3]**

(iii) Hence find the other two points of intersection of the curve with the x-axis. **[2]**

(iv) The region enclosed by the curve and the x-axis is shaded in the diagram. Use integration to find the total area of this region. **[5]**

Q9, (Jun 2013, Q7)



The diagram shows the curve $y = x^{\frac{3}{2}} - 1$, which crosses the x-axis at $(1, 0)$, and the tangent to the curve at the point $(4, 7)$.

(i) Show that $\int_1^4 (x^{\frac{3}{2}} - 1)\,dx = 9\frac{2}{5}$. **[4]**

(ii) Hence find the exact area of the shaded region enclosed by the curve, the tangent and the x-axis. **[5]**
