## Area Between a Curve and the x-Axis Exam Questions (from OCR 4722)

### Q1, (Jun 2010, Q6a)

Use integration to find the exact area of the region enclosed by the curve $y = x^2 + 4x$, the $x$-axis and the lines $x = 3$ and $x = 5$. **[4]**

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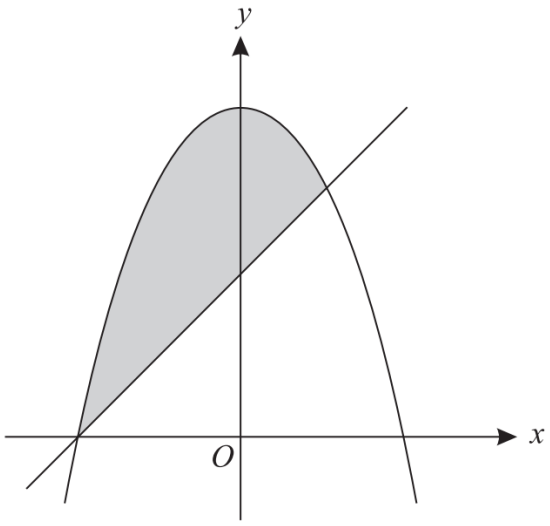
### Q2, (Jun 2006, Q4)




The diagram shows the curve $y = 4 - x^2$ and the line $y = x + 2$.

**(i)** Find the $x$-coordinates of the points of intersection of the curve and the line. [2]

**(ii)** Use integration to find the area of the shaded region bounded by the line and the curve. [6]

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### Q3, (Jan 2006, Q8)

The cubic polynomial $2x^3 + kx^2 - x + 6$ is denoted by $f(x)$. It is given that $(x + 1)$ is a factor of $f(x)$.

**(i)** Show that $k = -5$, and factorise $f(x)$ completely. [6]

**(ii)** Find $\int_{-1}^{2} f(x)\,dx$. [4]

**(iii)** Explain with the aid of a sketch why the answer to part **(ii)** does not give the area of the region between the curve $y = f(x)$ and the $x$-axis for $-1 \leqslant x \leqslant 2$. [2]

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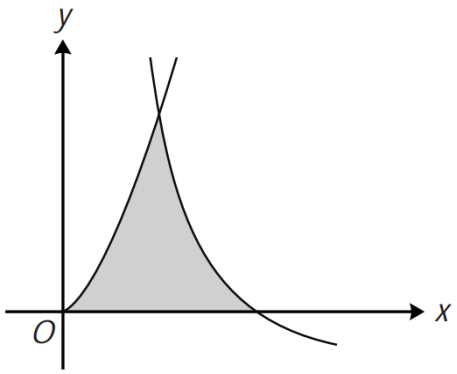
Q4, (Jan 2012, Q7b)




The diagram shows the curve $y = 6x^{\frac{3}{2}}$ and part of the curve $y = \frac{8}{x^2} - 2$, which intersect at the point (1, 6). Use integration to find the area of the shaded region enclosed by the two curves and the $x$-axis. **[8]**

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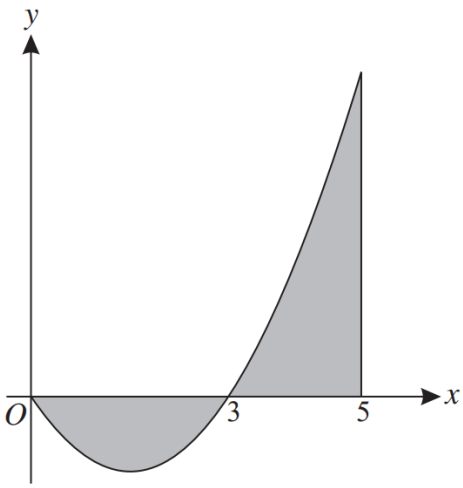
Q5, (Jan 2008, Q7)




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]

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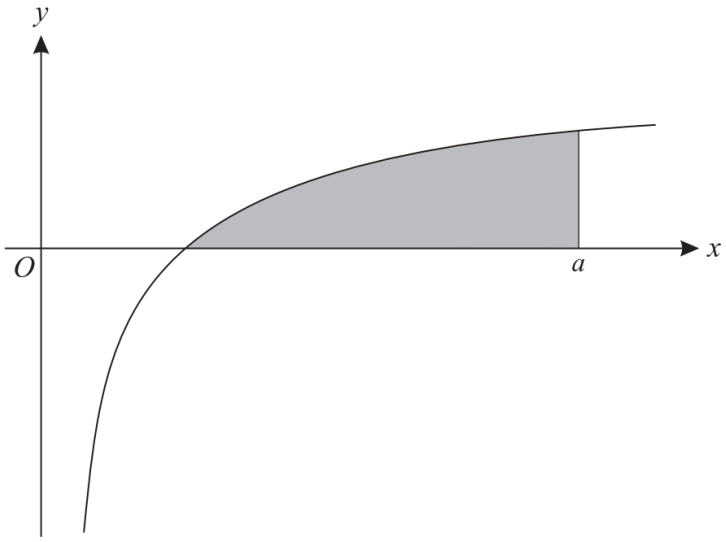
Q6, (Jan 2007, Q10)




The diagram shows the graph of $y = 1 - 3x^{-\frac{1}{2}}$.

**(i)** Verify that the curve intersects the $x$-axis at $(9, 0)$. [1]

**(ii)** The shaded region is enclosed by the curve, the $x$-axis and the line $x = a$ (where $a > 9$). Given that the area of the shaded region is 4 square units, find the value of $a$. [9]

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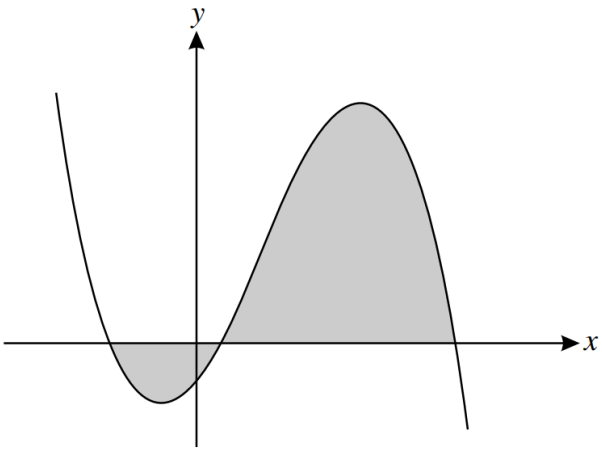
Q7, (Jan 2011, Q9)




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]**

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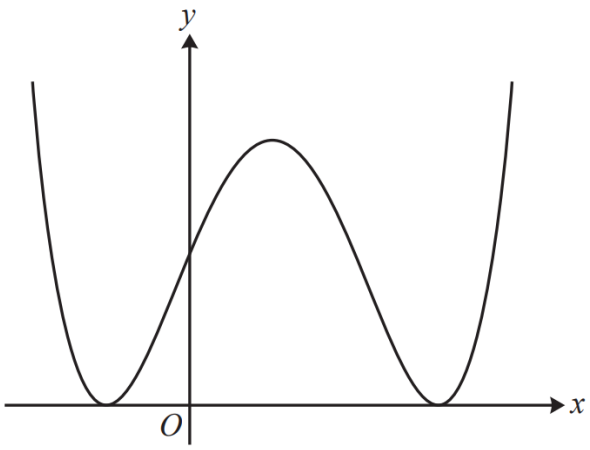
## Q8, (Jan 2016, Q7)

The cubic polynomial f($x$) is defined by f($x$) = $x^3 - 3x^2 - x + 3$.

**(i)** Find the quotient and remainder when f($x$) is divided by ($x + 1$). **[3]**

**(ii)** Hence find the three roots of the equation f($x$) = 0. **[3]**




The diagram shows the curve $C$ with equation $y = x^4 - 4x^3 - 2x^2 + 12x + 9$.

**(iii)** Show that the $x$-coordinates of the stationary points on $C$ are given by $x^3 - 3x^2 - x + 3 = 0$. **[2]**

**(iv)** Use integration to find the exact area of the region enclosed by $C$ and the $x$-axis. **[4]**

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## Q9, (Jan 2015, Q6)

The cubic polynomial f($x$) is defined by f($x$) = $x^3 - 19x + 30$.

**(i)** Given that $x = 2$ is a root of the equation f($x$) = 0, express f($x$) as the product of 3 linear factors. **[4]**

**(ii)** Use integration to find the exact value of $\int_{-5}^{3} f(x)\,dx$. **[4]**

**(iii)** Explain with the aid of a sketch why the answer to part **(ii)** does not give the area enclosed by the curve $y$ = f($x$) and the $x$-axis for $-5 \leqslant x \leqslant 3$. **[2]**

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