Past Years Examination Questions

1 A curve is such that $\frac{dy}{dx} = \frac{6}{(2x-3)^2}$. Given that the curve passes through the point (3, 5), find the coordinates of the point where the curve crosses the x-axis. [6]

N2002/I/6

2 Express $f(x) = \frac{x^3+2}{x^2-1}$ in partial fractions. Hence find the value of $\int_{-4}^{-2} f(x)\,dx$, giving your answer correct to 3 significant figures.

N2002/I/11 (Maths C)

3 (i) Differentiate $x \sin x$ with respect to x. [2]

(ii) Hence evaluate $\int_0^{\frac{\pi}{2}} x \cos x\,dx$. [4]

N2002/II/7

4 *(a)* Find $\int \frac{5x^3+2}{x}\,dx$.

(b) Evaluate $\int_0^1 3 \sin 2x\,dx$.

(c) A curve passes through the point (1, 5) and has gradient given by $\frac{dy}{dx} = \frac{6}{(x+1)^2}$. Find the equation of the curve.

(d) Find $\frac{d}{dx}\sqrt{x^3+1}$ and hence evaluate

$\int_0^2 \frac{x^2}{\sqrt{x^3+1}}\,dx$.

N2002/II/7 (AO Maths)

5 A curve is such that $\frac{dy}{dx} = 1 - 2x^2$. Given that the curve passes through the point (3, 2), find the equation of the curve.

N2003/I/3 (AO Maths)

6 *(a)* (i) Express $\frac{3x}{x+2}$ in the form $a + \frac{b}{x+2}$, where a and b are constants.

(ii) Evaluate $\int_{-1}^{2} \frac{3x}{x+2}\,dx$.

(b) (i) Show that $\frac{d}{dx}(\sin^2 x \cos x)$ can be written as $2 \sin x - 3 \sin^3 x$.

(ii) Hence evaluate $\int_0^{\frac{\pi}{4}} \sin^3 x\,dx$.

N2003/II/7 (AO Maths)

7 (i) Given that $y = (2x+3)\sqrt{4x-3}$, show that $\frac{dy}{dx}$ can be written in the form $\frac{kx}{\sqrt{4x-3}}$ and state the value of k. [5]

(ii) Hence evaluate $\int_1^7 \frac{x}{\sqrt{4x-3}}\,dx$. [3]

N2003/II/9

8 Differentiate $x \sin 4x$ with respect to x.

Hence find $\int_0^{\frac{\pi}{8}} x \cos 4x\,dx$.

N2004/I/7 (AO Maths)

9 Use partial fractions to evaluate $\int_2^3 \frac{9x^2}{(x-1)^2(x+2)}\,dx$, giving your answer in an exact form.

N2004/I/13 (Maths C)

10 Evaluate

(i) $\int_1^4 \frac{5}{2x+1}\,dx$,

(ii) $\int_{2.5}^{3} e^{2x-6}\,dx$.

N2004/II/3 (AO Maths)

11 A curve has the equation $y = (x+2)\sqrt{x-1}$.

(i) Show that $\frac{dy}{dx} = \frac{kx}{\sqrt{x-1}}$, where k is a constant, and state the value of k. [4]

(ii) Hence evaluate $\int_2^5 \frac{x}{\sqrt{x-1}}\,dx$. [4]

N2005/I/8

12 Find (i) $\int \frac{20}{(5x+2)^3}\,dx$,

(ii) $\int 4 \sin(3x-1)\,dx$.

N2005/I/13*(a)* (AO Maths)

13 (i) Given that $y = x \sin 2x + \frac{1}{2}\cos 2x$, find $\frac{dy}{dx}$.

(ii) Hence evaluate $\int_0^{\frac{\pi}{4}} x \cos 2x\,dx$.

N2005/II/7 (AO Maths)

14 A curve is such that $\frac{d^2y}{dx^2} = 6x - 2$. The gradient of the curve at the point (2, –9) is 3.

(i) Express y in terms of x. [5]

(ii) Show that the gradient of the curve is never less than $-\frac{16}{3}$. [3]

N2005/II/10

15 (i) Find $\int (5x^2 - 8x)\,dx$.

(ii) Evaluate $\int_0^1 e^{-2x}\,dx$.

N2006/I/9 (AO Maths)

16 Prove that $\sin 3\theta \equiv 3\sin\theta - 4\sin^3\theta$.

Hence evaluate $\int_0^{\frac{\pi}{3}} \sin^3\theta\,d\theta$.

N2006/I/10 (part) (Maths C)

17 Evaluate $\int_0^{\frac{\pi}{6}} \sin\left(2x + \frac{\pi}{6}\right) dx$. N2006/II/3

18 (i) Given that $y = \frac{x}{(x^2+9)^{\frac{1}{2}}}$,

show that $\frac{dy}{dx} = \frac{9}{(x^2+9)^{\frac{3}{2}}}$.

(ii) Hence evaluate $\int_0^4 \frac{45}{(x^2+9)^{\frac{3}{2}}}\,dx$.

N2006/II/7 (AO Maths)

19 Evaluate $\int_0^3 \frac{1}{4x+3}\,dx$. N2007/II/3 (AO Maths)

20 A curve is such that $\frac{dy}{dx} = \sqrt{2x+5}$. Given that the curve passes through the point (2, 10), find the equation of the curve.

N2007/II/4 (AO Maths)

21 Find the exact value of $\int_0^{\frac{5\pi}{3}} \sin^2 x\,dx$. Hence find the exact value of $\int_0^{\frac{5\pi}{3}} \cos^2 x\,dx$.

N2007/II/4 (part) (Maths C)

22 (i) Given that $y = xe^{2x}$, find $\frac{dy}{dx}$.

(ii) Hence find $\int xe^{2x}\,dx$. N2007/II/5 (AO Maths)

23 (i) Find $\frac{d}{dx}(x^3 \ln x)$. [2]

(ii) Hence find $\int x^2 \ln x\,dx$. [3]

N2008/I/4

24 (i) Express $\frac{7}{2x^2 - x - 6}$ in partial fractions, [3]

(ii) Hence evaluate $\int_3^9 \frac{7}{2x^2 - x - 6}\,dx$. [5]

N2009/II/2

25 A curve is such that $\frac{d^2y}{dx^2} = 6x - 6$. The curve passes through the point (3, 10) and at this point the gradient of the curve is 12. Find the coordinates of the stationary point of the curve and determine the nature of this stationary point. [11]

N2009/II/2