S4A TOPICAL INTENSIVE REVISION WEEK 7

Topic: INTEGRATION & APPLICATIONS Total marks: 48

1. For a particular curve, $\frac{d^2y}{dx^2} = 6x + e^{-\frac{1}{3}x}$. The curve passes through the point $P(0,12)$ and the gradient of the curve at P is -5. Find the equation of the curve. [6]

2. a. Given that $\int_0^3 f(x)dx = a$ and $\int_0^3 g(x) = -2a$, where a is a real number, find the value of a if $\int_3^0 f(x)dx + \int_0^3 g(x) = \int_0^3 e^{-3x}dx$ [4]

   bi. Given that $y = ln(\frac{x-3}{x+3})$, show that $\frac{dy}{dx} = \frac{6}{x^2-9}$. [3]

   bii. Hence, evaluate $\int_4^6 \frac{2x+3}{x^2-9}dx$. [5]

3. a. By differentiating $ln(\cos x)$, find $\int \tan x\, dx$. [4]

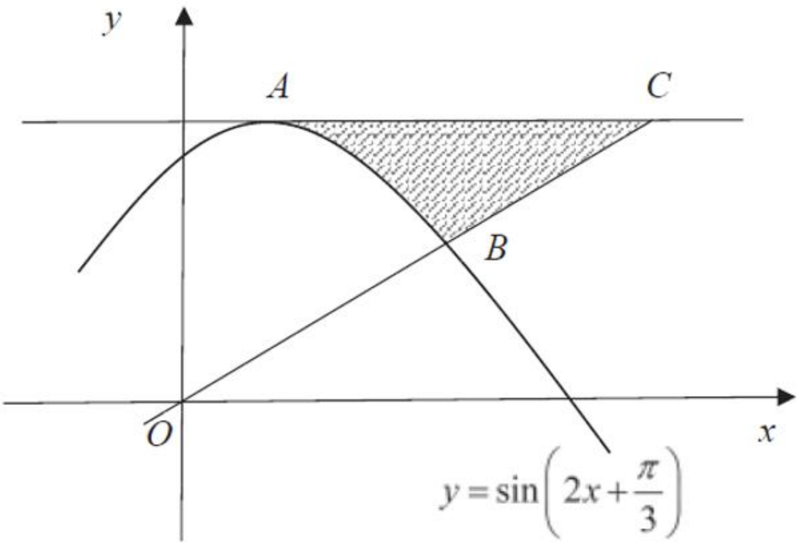
   b. Given that $y = x \tan x$, find $\frac{dy}{dx}$. [2]

   c. Using your answers to (a) and (b), find $\int x \sec^2 x\, dx$. [2]

4. a. Express $\frac{1-3x-2x^2}{x(1+2x)^2}$ in partial fractions. [5]

   b. Find the value of $\int_1^2 \frac{1-3x-2x^2}{x(1+2x)^2}dx$. [4]

5. The diagram shows part of the curve $y = sin(2x + \frac{\pi}{3})$ for $0 \leq x \leq \frac{\pi}{2}$, where A is the maximum point of the curve. OC is a straight line that cuts the curve at B and AC is parallel to the x-axis. Given that the x-coordinate of B is $\frac{\pi}{4}$, show that the area of the shaded region is $(\frac{11\pi}{48} - \frac{\sqrt{3}}{4}) units^2$. [12]



Answer Key

1.	$y = x + 9e^{-\frac{1}{3}x} - 2x + 3$
2(a).	A=-0.111
2(bii).	1.77
3(a).	$-\ln(\cos x) + c$
3(b).	$x\sec^2 x + \tan x$
3(c).	$x\tan x + \ln(\cos x) + c$
4(a).	$\frac{1}{x} - \frac{3}{1+2x} - \frac{4}{(1+2x)^2}$
4(b).	-0.340