CHEMISTRY ONLINE
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PURE MATH

ALGEBRA AND FUNCTION

Level & Board	EDEXCEL (A-LEVEL)
TOPIC:	INTEGRATION
PAPER TYPE:	SOLUTION - 1
TOTAL QUESTIONS	8
TOTAL MARKS	26

INTEGRATION – 1

1.

$$\frac{y}{x} - \ln x = \ln c$$

$$\Rightarrow \quad d\left(\frac{y}{x} - \ln x\right) = d(\ln c)$$

$$d\left(\frac{y}{x}\right) - d(\ln x) = 0$$

$$\Rightarrow \quad \left(\frac{xdy - ydx}{x^2}\right) - \frac{1}{x}dx = 0$$

$$\left(\frac{xdy - ydx}{x^2}\right) = \frac{1}{x}dx$$

$$\Rightarrow \quad xdy - ydx = \frac{1}{x}dx$$

$$xdy - ydx = xdx$$

$$xdy = ydx + xdx$$

$$\Rightarrow \quad xdy = (y + x)dx$$

$$\frac{dy}{dx} = \frac{x + y}{x}$$

2.

Let $y = \sqrt[4]{x} = x^{1/4}$

we take $x = 16$

$\delta x = dx = 17 - 16 = 1$

$y = (16)^{1/4} = 2$

Now $y = x^{1/4}$

$d(y) = d(x^{1/4})$

$d(y) = \frac{1}{4}x^{\frac{1}{4}-1}dx$

$d(y) = \frac{1}{4}x^{-\frac{3}{4}}dx$

Put $x = 16, dx = 1$

$dy = \frac{1}{4}(16)^{-\frac{3}{4}}(1) = \frac{1}{4}(2)^{-3}$

$dy = \frac{1}{4}.\frac{1}{8} = \frac{1}{32} = 0.03125$

Thus $\sqrt[4]{17} \approx y + dy$

$$\sqrt[4]{17} = 2 + 0.03125$$
$$\sqrt[4]{17} = 2.03125$$

3. Let the radius of a circular disc $= x\ cm$

Area of a disc $= \pi r^2$

$$A = \pi r^2$$
$$d(A) = d(\pi r^2)$$
$$dA = \pi . 2x dx$$

As the diameter changes from 44 to 44.4,

So the radius changes from 22 to 22.4, so

$$x = 22, dx = 22.2 - 22 = 0.2$$
$$dA = \pi(2)(22)(0.2)$$
$$dA = 27.646\ cm^2$$

4.
$$= \int 3x^2 dx - \int 2x dx + \int 1 dx$$
$$= 3\int x^2 dx - 2\int x dx + \int 1 dx$$
$$= 3.\frac{x^{2+1}}{2+1} - 2.\frac{x^{1+1}}{1+1} + x + c$$
$$= 3.\frac{x^3}{3} - 2.\frac{x^2}{2} + x + c$$
$$= x^3 - x^2 + x + c$$

5. $= \int (2x+3)^{1/2} dx$

$\times$ and $\div$ by 2 to make derivative

$= \frac{1}{2} \int (2x+3)^{1/2} . 2dx$

$= \frac{1}{2} . \frac{(2x+3)^{1/2+1}}{1/2+1} + c$

$= \frac{1}{2} . \frac{(2x+3)^{3/2}}{3/2} + c$

$= \frac{1}{2} . \frac{2}{3} (2x+3)^{3/2} + c$

$= \frac{1}{3} (2x+3)^{3/2} + c$

6. Length of each edge of a cube $= x$ unit

Volume of cube $= L.W.H$

$$V = x.x.x$$

$$d(V) = (x^3)$$

$$dV = 3x^2 dx$$

When x changes from 5 to 5.02, so

$x = 5,\ dx = 5.02 - 5 = 0.02$

$dV = 3(5)^2(0.02) = 1.5\ cube\ units$

7.

$$= \int \frac{1}{(2x+3)^4}\,dx$$

$$= \int (2x+3)^{-4} dx$$

$$= \frac{\mathbf{1}}{\mathbf{2}} . \frac{\mathbf{(2x+3)^{-4+1}}}{\mathbf{-4+1}} + \boldsymbol{c}$$

$$= -\frac{\mathbf{1}}{\mathbf{6(2x+3)^3}} + \boldsymbol{c}$$

8. We know that

$$\frac{d}{dx}[lnf(x)] = \frac{1}{f(x)} . f'(x)$$

Taking integration on both sides

$$\int \frac{d}{dx}[lnf(x)] = \int \frac{1}{f(x)} . f'(x)$$

$$\Longrightarrow \quad lnf(x) = \int \frac{f'(x)}{f(x)}\,dx$$

$$\Longrightarrow \quad \int \frac{f'(x)}{f(x)}\,dx = lnf(x) + c$$ By definition

$$(\int f(x)\,dx = F(x) + c$$

Hence proved.

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