CHEMISTRY ONLINE
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PURE MATH

ALGEBRA AND FUNCTION

Level & Board	EDEXCEL (A-LEVEL)
TOPIC:	INTEGRATION
PAPER TYPE:	SOLUTION - 4
TOTAL QUESTIONS	8
TOTAL MARKS	26

INTEGRATION – 4

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

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

$\sqrt[4]{17} = 2.03125$

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

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

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

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

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

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

$xdy - ydx = xdx$

$xdy = ydx + xdx$

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

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

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

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

$$A = \pi r^2$$

$$d(A) = d(\pi r^2)$$

$$dA = \pi . 2xdx$$

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.

$$= \int 3x^2 dx - \int 2xdx + \int 1dx$$

$$= 3\int x^2 dx - 2\int xdx + \int 1dx$$

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

$$= 3.\frac{x^3}{3} - 2.\frac{x^2}{2} + x + c$$

$$= x^3 - x^2 + x + c$$

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

$\times$ and $\div$ by 2 to make a 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. $xy + x = 4$

Taking differentials on both sides

$d(xy+x) = d(4)$

$xdy + ydx + dx = 0$

$xdy + (y+1)dx = 0$

$xdy = -(y+1)dx$

$\frac{dy}{dx} = -\frac{y+1}{x}$ and $\frac{dx}{dy} = -\frac{x}{y+1}$

7.

$$= \int \frac{e^{2x}+e^{x}}{e^{x}}\,dx$$

$$= \int \left[\frac{e^{2x}}{e^{x}} + \frac{e^{x}}{e^{x}}\right] dx$$

$$= \int [e^{x} + 1] dx$$

$$= \int e^{x} dx + \int 1 dx$$

$$= \frac{e^{x}}{1} + x + c$$

$$= e^{x} + x + c$$

8.

$$= \int tan^{2} x dx$$

$$= \int (sec^{2} x - 1) dx$$

$$\therefore 1 + tan^{2}\theta = sec^{2}\theta$$

$$= \int sec^{2} x dx - \int 1\, dx$$

$$= tanx - x + c$$

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