ID : 12290

MULTIVARIATE CALCULUS (Final Term Paper)

Date:

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Q.1 Evaluate $\int_0^5 \int_0^x (x+3x)\, dy\, dx$

Solution =

$$= \int_0^5 \left[\int_0^x (x^2+3x^2)\, dy\right] dx$$

$$\int_0^5 (x^2+3x^2)\, y \int_0^x dx$$

$$= \int_0^5 (x^2+3x^2)(x-0)\, dx$$

$$\int_0^5 x^3+3x^3\, dx$$

$$= \int_0^5 4x^3\, dx$$

$$= \frac{4x^4}{4} \int_0^5 \quad = (5)^4 - (0)^4$$

$$= \boxed{625} \text{ Ans}$$

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Q2 Evaluate $\int_1^4 \int_0^3 (xy + x^3y^3)\, dy\, dx$

Solution:-

$$= \int_1^4 \left[\int_0^3 xy\, dy + \int_0^3 x^3y^3\, dy\right] dx$$

$$= \int_1^4 \left[\left(\frac{xy^2}{2}\Big|_0^3\right) + \frac{x^3y^4}{4}\Big|_0^3\right] dx$$

$$= \int_1^4 \left(x(9-0) + \frac{x^3}{4}(81-0)\right] dx$$

$$= \int_1^4 \left(\frac{9}{2}x + \frac{81}{4}x^3\right) dx$$

$$= \frac{9}{2}\left(\frac{x^2}{2}\right)\Big|_1^4 + \frac{81}{4}\,\frac{x^4}{4}\Big|_1^4$$

$$= \frac{9}{4}(16-1) + \frac{81}{16}(256)$$

$$= \frac{135}{4} + 1296 = \boxed{\frac{1431}{4}}$$ Answer.

Q3 Find partial derivatives w.r.t r & s $f(r,s) = r.\ln(r^3+s^2)$

Solution:-

$$f(r,s) = r\ln(r^3+s^2)$$

$$\frac{df}{dr} = \frac{d}{dr}\left[r\ln(r^3+s^2)\right]$$

$$= \ln(r^3+s^3) + r\left(\frac{1}{r^3+s^2}\right)3r$$

$$\frac{df}{dr} = \ln(r^3+s^3) + \frac{3r^2}{r^3+s^2}$$

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$$\frac{df}{ds} = \frac{d}{ds} r \ln(r^3+s^2)$$

$$= r\left(\frac{1}{r^3+s^2}\right)\frac{d}{ds}(r^3+s^2)$$

$$= \frac{r}{r^3+s^2}(2s)$$

$$\boxed{\frac{df}{ds} = \frac{2sr}{r^3+s^2}}$$ Answer.

Q4 Find partial derivitives wrt 'x'

$$F(x,y,z) = xy^2z^4 + 3yz^2$$

Solution:

$$\frac{dF}{dx} = \frac{d}{dx}(xy^2z^4) + \frac{d}{dx}(3yz^2)$$

$$= (1)\,y^2z^4 + 0$$

$$\boxed{\frac{dF}{dx} = y^2z^4}$$ Answer.

P.T.O.

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Q5: Find the value of x & y

Solutions:-

$$8x - y = -1 \quad \text{——} \ (i)$$
$$7x - y = -2 \quad \text{——} \ (ii)$$

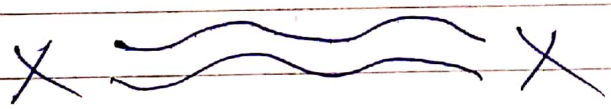
Now subtracting eq (ii) from eq (i)

$$8x - y = -1$$
$$7x \ominus y = \ominus 2$$
$$+ \quad +$$

$$\boxed{x = 1}$$

Now putting $x = 1$ in eq (i)

$$\Rightarrow 8(1) - y = -1$$
$$\Rightarrow -y = -1 - 8$$
$$\Rightarrow \boxed{y = 9} \quad \text{Ans}$$



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