

UNIVERSITY OF PETROLEUM & ENERGY STUDIES, DEHRADUN

Program	B.Tech (All SoCSBranches)	Semester	I
Course	Engineering Mathematics	Course Code	MATH 1036

- Find the n th derivative of $\frac{1}{1-5x+6x^2}$.
- Find the n th derivative of $\sin 6x \cos 4x$.
- If $y\sqrt{1+x^2} = \log(x + \sqrt{1+x^2})$, prove that $(1+x^2)y_{n+2} + (2n+3)x y_{n+1} + (n+1)^2 y_n = 0$.
- Show that $f_{xyz} = f_{yzx}$ for all (x,y,z) when $f(x,y,z) = e^{xy} \sin z$.
- If $u = \sin^{-1}\left(\frac{x^2+y^2}{x+y}\right)$, then $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = \tan u$.
- Find the local maximum/minimum values of the function $f(x,y) = x^2 - y^2 - 2y$.
- Evaluate $\int_0^1 \int_0^{\sqrt{1+x^2}} \frac{dy dx}{1+x^2+y^2}$.
- Let D be the region in the first quadrant bounded by the curves $xy=16, x=y, y=0$ and $x=8$. Sketch the region of integration of the integral $\iint_D x^2 dx dy$ and evaluate it by expressing it as an appropriate repeated integral.
- Evaluate $\int_0^1 \int_x^{\sqrt{x}} (x^2 + y^2) dy dx$.
- Evaluate $\iint (x^2 + y^2) dx dy$ over the region in positive quadrant for which $x + y \leq 1$.
- Evaluate $\int_0^{\log 2} \int_0^x \int_0^{\log y} e^{x+y+z} dz dy dx$.
- Evaluate $\iiint xyz dz dy dx$ over the volume enclosed by the planes $x=0, y=0, z=0$ and $x + y + z = a$.
- Evaluate $\int_0^{\pi a(1-\cos \theta)} \int_0^r r^2 \sin \theta dr d\theta$.
- Evaluate by changing the order of integration: $\int_0^1 \int_{e^x}^e \frac{dy dx}{\log y}$.
- Evaluate by changing the order of integration: $\int_0^1 \int_{2y}^2 e^{x^2} dx dy$.