Department of Mathematics and Natural Sciences

MAT 120: Integral Calculus & Differential Equations

Spring 2024

ASSIGNMENT 3

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1. Evaluate the double integral $\int\int_R (x+y)dA$ where the region R is defined as $\{(x,y)|1 \leq x^2+y^2 \leq 4, x \leq 0\}$. [4]

2. (a) Change the triple integral $\int_{-3}^{3}\int_{-\sqrt{9-x^2}}^{\sqrt{9-x^2}}\int_{0}^{\sqrt{9-x^2-y^2}} z\sqrt{x^2+y^2+z^2}dzdydx$ to cylindrical coordinates and then solve. [2]

   (b) Change the triple integral $\int_{-3}^{3}\int_{-\sqrt{9-x^2}}^{\sqrt{9-x^2}}\int_{0}^{\sqrt{9-x^2-y^2}} z\sqrt{x^2+y^2+z^2}dzdydx$ to spherical coordinates and then solve. [2]

3. Determine whether the equation $\cos x dx + \left(1+\frac{2}{y}\right)\sin x dy = 0$ is exact or not. Then solve the equation using the proper method. [4]

4. The population of a town grows at a rate proportional to the population present at time t. The initial population of 500 increases by 15% in 10 years. What will be the population in 30 years? How fast is the population growing at $t = 30$ years? [4]

5. Solve $\frac{dr}{d\theta} + r\sec\theta = \cos\theta$ [4]