

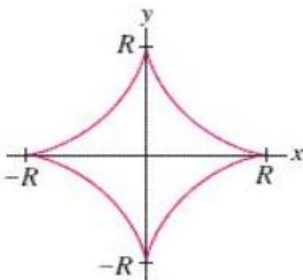


		Reg. No.:	
		Name :	
 			
Mid-Term Examinations – October 2021			
Programme	: BTECH	Semester	: Fall 2021-22
Course	: Calculus and Laplace Transform	Code	: MAT1001
Faculty	: Dr. Yogesh Shukla	Slot/ Class No.	: D11+D12+D13/BL2021 221000491
Time	: 1 ½ hours	Max. Marks	: 50
Answer all the Questions			
Q.No.	Sub. Sec.	Question Description	Marks
1		If $x + y = 2e^\theta \cos \phi$, $x - y = 2ie^\theta \sin \phi$, Prove that $\frac{\partial^2 u}{\partial \theta^2} + \frac{\partial^2 u}{\partial \phi^2} = 4xy \frac{\partial^2 u}{\partial x \partial y}$	10
2		Show that the function $u = \log\left(\frac{1}{r}\right)$, where $r = \sqrt{(x - a)^2 + (y - b)^2}$ satisfies the partial differential equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$	10
3		Given graph is representation of asteroid $x^{2/3} + y^{2/3} = a^{2/3}$  (A) Find the coordinate of given graph and also labelled the graph. (B) Find the total area of asteroid by integral calculus.	10
4		Find the volume of region bounded by elliptic paraboloids : $z = x^2 + 9y^2$ and $z = 18 - x^2 - 9y^2$.	10
5		Prove that $\text{div}(r^n R) = (n + 3)r^n$. Hence show that $\frac{R}{r^3}$ is solenoidal.	10
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