



VIT[®]
Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)

A

School of Advanced Sciences
Department of Mathematics
Fall Semester 2019-2020
MAT-1011: Calculus for Engineers (MATLAB)

Date: xx.11.2019

FINAL ASSESSMENT TEST

SLOT: LXX+LXX

1. Demonstrate Rolle's theorem for the function $f(x) = x^5 - 5x^3 + 4x$ in the interval $(-3, 3)$. Plot the graph of the function $f(x)$ and show the points inside the interval $(-3, 3)$ which obey the Rolle's theorem. [20]
2. (a) Find the Laplace transform of the function $f(t) = \begin{cases} \sin t & ; 0 \leq t \leq \pi \\ 0 & ; \pi \leq t \leq 2\pi \end{cases}$ [10]
- (b) Find the Inverse Laplace transformation of the function $\frac{4s+5}{(s-1)^2(s+2)}$ [10]



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1. (a) Find the critical values of the function $f(x) = x^3 - 6x^2 + 9x + 2$. [8]
- (b) Find the values of the second derivative of $f(x)$ and check the sign of the $f''(x)$ at the critical points and sketch the graph of the function $f(x)$ with necessary formatting. [12]
2. Find the value of integral $\int_0^1 \int_x^{\sqrt{2-x^2}} \frac{x}{\sqrt{x^2+y^2}} dy dx$. Using 'surf', visualize the surface $f(x, y) = \frac{x}{\sqrt{x^2+y^2}}$. [20]



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1. Find the Taylor series expansion of the function $f(x, y) = \tan^{-1}(y/x)$ upto the terms of 3rd degree at the point (1, 1). [20]
Plot the graph of the function $f(x, y)$ using *surf* in the neighbourhood of the given point. Include the necessary information such as title, axis etc. in the graph.
2. Evaluate the area bounded by the two curves $y = x^2$ and $y = 2x$ using MATLAB. [20]
Sketch the curves which indicate the required area.



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1. Find the gradient of the scalar function $f(x, y) = \sqrt{x^2 + y^2}$. [20]
Plot the vector field of the gradient and also show the scalar function using contour curves.
2. Find the work done by the force field $\vec{f} = x\hat{i} + y\hat{j} + z\hat{k}$ in moving a particle along the curve C given in its parametric form as $x = \cos \pi t$, $y = t^2$ and $z = \sin \pi t$ from $t = 0$ to $t = 1$. [20]
Check whether the force field is conservative.
