Northern Cyprus Campus


Please write down all commands (or the content of the M-file) that you use in MATLAB in order to perform the given task. You do not need to write anything about the unsuccesful trials. Also write down the answer of the question. Builtin shortcuts of MATLAB are not allowed to solve the problem (such as "inv" for inverse etc.), however you may use them to check your final answers. You may also use MATLAB Help window whenever necessary

Q1 (25 pts.) Find the inverse of the following matrix, using the Gauss-Jordan method:

$$
\left[\begin{array}{cccc}
3 & -2 & 7 & 1 \\
1 & 6 & 0 & 1 \\
2 & -2 & 3 & 3 \\
0 & 0 & 3 & 0
\end{array}\right]
$$

Q2 (3+11+11 pts.) Let $A=\left[\begin{array}{lll}6 & 1 & 5 \\ 1 & 2 & 3 \\ 5 & 3 & 4\end{array}\right]$.
(a) Find the characteristic polynomial of $A$ (by pencil and paper).
(b) Find the eigenvalues of $A$ by using the Newton-Ralphson method.
(c) Find all eigenvectors of $A$.

Q3 (25 pts.) Let $R$ be the rectangle $[0,1] \times[0,1]$ in the Cartesian plane, and let $f(x, y)=$ $\cos \left(\sin \left(x^{2}+y\right)\right)$. By writing a MATLAB function (M-file), compute the double integral

$$
\iint_{R} f(x, y) d x d y
$$

Q4 ( $\mathbf{1 0 + 3 + 1 2 = \mathbf { 2 5 }} \mathbf{~ p t s . ) ~ S u p p o s e ~ t h a t ~ a n ~ e l l i p s e ~ o f ~ t h e ~ f o r m ~} A x^{2}+B x+C y^{2}=1$ passes through the points $(-1,1.0583),(-1.5,0.9695)$ and ( $-0.5,-0.9695$ ).
(a) Find $A, B, C$ (Use MATLAB, after forming the relevant linear system).
(b) Write the equation in the form $\frac{\left(x-x_{0}\right)^{2}}{a^{2}}+\frac{y^{2}}{b^{2}}=1$ for suitable $a, b, x_{0}$.
(c) Find the total arclength of the ellipse (Hint: arclength $=\int_{C} \sqrt{(d x)^{2}+(d y)^{2}}$ ).

