

MATH 353 L01 - 02 W 2010

MAPLE ASSIGNMENT

- (a) Evaluate π to 10 digits [Ans. = 3.141592654]
(b) Evaluate π to 100 digits.
(c) What is the 100th digit of π ? Explain your answer.

2. Evaluate

$$\int_0^{\pi/2} (7 \sin^4 x + 5 \cos^6 x)^2 dx \quad [20335\pi/2048]$$

- (a) Plot $y = x^3 - 2x^2 - x - 1$, $-3 \leq x \leq 3$.
(b) Using (a), estimate the zeros (roots) of this cubic polynomial.
(c) Use the fsolve command to obtain accurate estimations of the zeros.

4. Consider the 4×4 symmetric matrix $C = \begin{bmatrix} 4 & 3 & 1 & 6 \\ 3 & 22 & 0 & 3 \\ 1 & 0 & 3 & -2 \\ 6 & 3 & -2 & 21 \end{bmatrix}$

- (a) Find $\det(C)$. [1556]
(b) Find the eigenvalues of C .
(c) Is C positive definite, negative definite, or indefinite. Explain.
- (a) Make a 3-dimensional plot of $z = f(x, y) = y^2 - x^2$, $-1 \leq x \leq 1, -2 \leq y \leq 2$.
(b) Make a contour plot of the same function, $-2 \leq x \leq 2, -2 \leq y \leq 2$.
(c) By inspection of (a) or (b), describe the type of critical point f has at $(0, 0)$.

6. Evaluate

$$\int_1^2 \int_0^x \int_0^{3y-x} (x^3 y^4 + e^z) dz dy dx \quad \left[-\frac{1}{3e} + \frac{2919}{100} - \frac{e^2}{6} + \frac{1}{3e^2} + \frac{e^4}{6}\right]$$

- Find and classify the extrema of $f(x, y) = (x^2 + 3y^2)e^{1-x^2-y^2}$.

8. Evaluate the line integral $\int_{\mathcal{C}} \langle y, x, z^2 \rangle \bullet d\mathbf{r}$, where \mathcal{C} is the path $\mathbf{r}(t) = \langle t^2 + t, 2t, t^4 + t^3 \rangle$, $1 \leq t \leq 3$. [1259908/3]
9. Evaluate the surface integral of $x^2 + y + z$ over the surface \mathcal{S} given by $\mathbf{r}(s, t) = \langle s, t, s + t \rangle$, $0 \leq s \leq 1$, $0 \leq t \leq 1$.
10. Consider the vector field $\mathbf{F}(x, y, z) = \langle 3xy^2 + z^3, xyz^9 - y^2, 3x^4 + yz^7 \rangle$.
- (a) Find $\text{Curl}(\mathbf{F}) = \nabla \times \mathbf{F}$.
 - (b) Show the divergence of your answer in (a) is 0, i.e.

$$\nabla \bullet (\nabla \times \mathbf{F}) = 0 .$$