Unit 5 - Week 2

Assignment 2

The due date for submitting this assignment has passed.
As per our records you have not submitted this assignment.

Due on 2019-08-21, 23:59 IST.

Instructions: The objective of these questions is to assess your understanding of this week's content.You are not expected to memorize any of the questions, rather, you should derive the answers from first principles based on what you have learnt so far

1) Given N points, what is the minimum degree of a polynomial that passes through all the points? *1 point*

- N
- $N/2$
- $N/2-1$
- $N-1$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$N-1$

2) To what order is an N-point Gauss-Legendre quadrature rule accurate? *1 point*

- N
- $N/2$
- $2N$
- $2N-1$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$2N-1$

3) Which of the following is the correct expression for Simpson's rule? *1 point*

- $hf(\frac{a+b}{2})$
- $\frac{h}{2}[f(a)+f(b)]$
- $\frac{h}{3}[f(a)+4f(\frac{a+b}{2})+f(b)]$
- $\frac{h}{2}[f(a)-f(b)]$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$\frac{h}{3}[f(a)+4f(\frac{a+b}{2})+f(b)]$

4) Which of the polynomials are orthogonal to each other in the interval $x \in [-1, 1]$ *1 point*

- $1, x, (3x^2-1)/3$
- $1, x, x^2$
- $1, x, x^3$
- $1, x^2, (3x^2-1)/3$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$1, x, (3x^2-1)/3$

5) To derive the Trapezoidal integration formula, to how many terms is the Taylor series expansion of a function truncated? *1 point*

- Two
- Three
- Four
- Six

No, the answer is incorrect.
Score: 0
Accepted Answers:
Two

6) According to Weierstrass Approximation Theorem, any function $f(x)$ can be expressed as which of the following series? *1 point*

- $f(x)=\Sigma_{n=0}^{\infty} a_n \exp(-jnx)$
- $f(x)=\Sigma_{n=0}^{\infty} a_n \tanh(nx)$
- $f(x)=\Sigma_{n=0}^{\infty} a_n x^n$
- None of the above

No, the answer is incorrect.
Score: 0
Accepted Answers:
$f(x)=\Sigma_{n=0}^{\infty} a_n x^n$

7) Any quadrature rule is written in terms of: *1 point*

- Pre-computed weights
- Values of the function at pre-computed nodes
- Values of the function derivatives at pre-computed nodes
- A and B
- A and C
- None of the above

No, the answer is incorrect.
Score: 0
Accepted Answers:
A and B

8) The potential V at a point (x, y, z) due to a line charge $\rho(\vec{r}')$ of length L is given by: *1 point*

$$V(r)=\frac{1}{4\pi\epsilon_0}\int_L \frac{\rho(\vec{r})}{R^n}dl', \quad R=\sqrt{(x-x')^2+(y-y')^2+(z-z')^2},$$

where the value of n is:

- 0.5
- 1.0
- 1.5
- 2.0
- 3.0

No, the answer is incorrect.
Score: 0
Accepted Answers:
1.0

9) What is the type of the following integral equation, if $\rho(x)$ is an unknown function to be determined, and $f(x)$ is a known, non-zero function? *1 point*

$$f(x)=\int_0^1 \frac{\rho(x')}{|x-x'|^7}\,dx'$$

- Non homogeneous Freedholm integral equation of 1st kind
- Non homogeneous Freedholm integral equation of 2nd kind
- Homogeneous Freedholm integral equation of 1st kind
- Non homogeneous Volterra integral equation of 1st kind
- Non homogeneous Volterra integral equation of 2nd kind
- Homogeneous Volterra integral equation of 1st kind

No, the answer is incorrect.
Score: 0
Accepted Answers:
Non homogeneous Freedholm integral equation of 1st kind

10) A solution to an integral equation has been obtained by using $N=100$ pulse basis functions. This solution can be improved with least computational effort by: *1 point*

- Making $N=90$ and keeping the pulse basis functions
- Keeping $N=100$ and using triangular basis functions
- Making $N=110$ and using triangular basis functions
- Making $N=90$ and using triangular basis functions
- None of the above

No, the answer is incorrect.
Score: 0
Accepted Answers:
Keeping $N=100$ and using triangular basis functions

11) The Helmholtz equation is given by: $\nabla^2 E(r)+20E(r)=-10jK(r)$, where $K(r)$ is a surface current and $j=\sqrt{-1}$. There exists a function $g(r,r')$ such that $\nabla^2 g(r,r')+20g(r,r')=\delta(r,r')$, where $\delta(r,r')$ is a Dirac Delta function. The electric field is given by: *1 point*

- $E(r)=10j\,r\,g(r,0)$
- $E(r)=-5j\,K(r)\,g(r,0)$
- $E(r)=5j\int rg(r,r')dr'$
- $E(r)=-10j\int K(r')g(r,r')dr'$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$E(r)=-10j\int K(r')g(r,r')dr'$

12) For a magnetic medium with permeability given by the following space varying function, $\mu=\mu(r)$, the expression $\nabla(\nabla\cdot\vec{E})-\nabla^2\vec{E}$ simplifies to: *1 point*

- $\omega^2\mu(r)\epsilon(r)\vec{E}$
- $-\omega^2\mu(r)\epsilon(r)\vec{E}$
- $\omega^2\mu(r)/\epsilon(r)\vec{E}$
- None of the above

No, the answer is incorrect.
Score: 0
Accepted Answers:
None of the above

13) Consider a 2D cross-section of an $z-$invariant, infinitely long, perfect electric conductor that is contained in a surface S and bounded by a contour L with outward normal $\hat{n}$. The integral $\oint_L g(\vec{r},\vec{r}')(\nabla\phi\cdot\hat{n})$, where g is the free space Green's function, and ϕ is the $z-$component of the Electric field, evaluates to: *1 point*

- $\phi_i(\vec{r}')$
- 0
- $\oint\phi(\vec{r})(\nabla g(\vec{r},\vec{r}')\cdot\hat{n})dl$
- $\phi_i(\vec{r}')+\oint\phi(\vec{r})(\nabla g(\vec{r},\vec{r}')\cdot\hat{n})dl$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$\phi_i(\vec{r}')$