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# Unit 5 - Week 4



## Week 4 Assignment

**The due date for submitting this assignment has passed.** **Due on 2017-09-07, 11:59 IST.**

### Submitted assignment

1) A system (m equations) is hyperbolic at a point (x,t) for conservation law, if *1 point*

- Jacobian matrix of flux term (m numbers) with respect to variables has real eigenvalues
- Jacobian matrix of flux term (m numbers) with respect to variables has linearly independent eigenvectors
- Jacobian matrix of flux term (m numbers) with respect to variables has linearly dependent eigenvectors

**No, the answer is incorrect.**
**Score: 0**

**Accepted Answers:**
*Jacobian matrix of flux term (m numbers) with respect to variables has real eigenvalues*
*Jacobian matrix of flux term (m numbers) with respect to variables has linearly independent eigenvectors*

2) Total Variation Diminishing (TVD) scheme is *1 point*

- nonmonotonic
- monotonicity preserving method

**No, the answer is incorrect.**
**Score: 0**

**Accepted Answers:**
*monotonicity preserving method*

3) Slope at $P^{th}$ cell in numerical flux calculation with high resolution methods for Fromm method can be calculated as, *1 point*

- $\sigma_P^n = 0$
- $\sigma_P^n = \frac{\sigma_E^n - \sigma_W^n}{2\Delta x}$
- $\sigma_P^n = \frac{\sigma_P^n - \sigma_W^n}{2\Delta x}$
- $\sigma_P^n = \frac{\sigma_E^n - \sigma_P^n}{2\Delta x}$

**No, the answer is incorrect.**
**Score: 0**

**Accepted Answers:**
$\sigma_P^n = \frac{\sigma_E^n - \sigma_W^n}{2\Delta x}$

Week 11

Week 12

4) Numerical flux function for Godunov method in case of one dimensional conservational law with flux term $\mathcal{F}_\phi = a\phi$, [where *a*= constant, $a^+ = \max(a,0)$, $a^- = \min(a,0)$] is **1.5 points**

- $\bar{\mathcal{F}}_\phi(\phi_e(0)) = a^-\phi_E^n + a^+\phi_P^n$
- $\bar{\mathcal{F}}_\phi(\phi_e(0)) = a^-\phi_P^n + a^+\phi_E^n$
- $\bar{\mathcal{F}}_\phi(\phi_w(0)) = a^-\phi_P^n + a^+\phi_W^n$
- $\bar{\mathcal{F}}_\phi(\phi_w(0)) = a^-\phi_W^n + a^+\phi_P^n$

**No, the answer is incorrect.**
**Score: 0**

**Accepted Answers:**
$\bar{\mathcal{F}}_\phi(\phi_e(0)) = a^-\phi_E^n + a^+\phi_P^n$
$\bar{\mathcal{F}}_\phi(\phi_w(0)) = a^-\phi_P^n + a^+\phi_W^n$

5) Numerical flux function for upwind method in case of one dimensional conservational law with flux term $\mathcal{F}_\phi = a\phi$ (where a= constant) is **1.5 points**

- $\bar{\mathcal{F}}_\phi(\phi_P^n, \phi_E^n) = a\phi_E^n$ for a<0
- $\bar{\mathcal{F}}_\phi(\phi_P^n, \phi_E^n) = a\phi_P^n$ for a>0
- $\bar{\mathcal{F}}_\phi(\phi_P^n, \phi_W^n) = a\phi_P^n$ for a<0
- $\bar{\mathcal{F}}_\phi(\phi_P^n, \phi_W^n) = a\phi_W^n$ for a>0
- All of the above

**No, the answer is incorrect.**
**Score: 0**

**Accepted Answers:**
*All of the above*

6) Lax-Friedrichs scheme for one dimensional conservational law with flux term $\mathcal{F}_\phi = a\phi$ (where a= constant) is **1 point**

- Unconditionally stable
- Unconditionally unstable
- Conditionally stable
- Conditionally unstable

**No, the answer is incorrect.**
**Score: 0**

**Accepted Answers:**
*Conditionally stable*
*Conditionally unstable*

7) In Riemann problem, variable value **1 point**

- is same on both sides of a face under consideration.
- is different on both sides of a face under consideration.

**No, the answer is incorrect.**
**Score: 0**

**Accepted Answers:**
*is different on both sides of a face under consideration.*

8) Partition of unity means **1 point**

- Summation of all shape functions within support domain except the point under consideration is equal to 1.
- Summation of all shape functions within support domain is equal to 1.
- Shape function value at point under consideration is equal to 1.

**No, the answer is incorrect.**
**Score: 0**

**Accepted Answers:**
*Summation of all shape functions within support domain is equal to 1.*

9) Polynomial basis of order 2 in one dimension contains ***1 point***

- $1\ x$
- $1\ x\ x^2$
- $x\ x^2$
- $1\ x^2$

**No, the answer is incorrect.**
**Score: 0**

**Accepted Answers:**
$1\ x\ x^2$

10) In mesh-free method, node spacing $(d_c)$ in two-dimension depends on ***1 point***

- Volume of estimated support domain
- Area of estimated support domain
- Length of estimated support domain

**No, the answer is incorrect.**
**Score: 0**

**Accepted Answers:**
*Area of estimated support domain*

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