0512-1820 Fall 2024
Home Assignment #4

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Due date: 01/03/2025

In this assignment, you will implement a program in C that models a Student structure and manipulates a collection of students using dynamic memory allocation, pointers, and linked lists.

Submission Guidelines

- Due date is **01/03/2025**
- Submission by couples only!
- Submission by **pairs**. Only one student of the pair should submit the submission file.
- Submission file is: **hw4_ID1_ID2.zip**
  The zip should include the following files:
  - **ex1.c**
  - **ex2.c**

  E.g. for students with IDs: 123456789, 987654321 the zip file should be named:

  hw4_123456789_987654321.zip

Question 1: Student Structure and Linked List Manipulation

Implement a program in C that models a Student structure and manipulates a collection of students. The program should include:

- A **Student** struct with fields: ID, name, age, GPA, and a pointer to the next student.
- Functions to:

- Create a new student dynamically.
- Print a student's details.
- Create and manage a linked list of students.
- Find the student with the highest GPA.
- Delete the student with the lowest GPA.
- Free all allocated memory.

Question 2: Triangle Operations in 3D Space

In this question, you will write a C program to perform operations on a triangle in 3D space:

- Define a **Point** struct to represent a point in 3D with fields x, y, and z.
- Define a **Triangle** struct to represent a triangle formed by three points.
- Implement the following mathematical calculations:
  - A **distance** function to compute the Euclidean distance between two points in 3D space.
  - A **perimeter** function to calculate the perimeter of the triangle by summing the distances of its three sides.
  - An **area** function to calculate the triangle's area using the cross product of vectors formed by its sides.
- Write a function that asks the user to provide 3 points, in the format `x1 y1 z1`, with numbers separated by spaces only, and then calculates the perimeter and area of the triangle formed by those points.