# CMSC 425 – Spring 2018 – Homework 1

**Directions:** Either print this page (**single-sided**) and handwrite your answers or type your answers (using the Word version). Because we will use special grading software, **please write your answers only within the space provided**. If extra space is needed, please add it to the **end** of the assignment and provide a note indicating this.

If hand-written, produce an enhanced quality scan (e.g., using an app like CamScanner) and upload a pdf file. If typed, export this as a pdf file and upload that.

**Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Section (check one):** 0101 (Mount) 0201 (Eastman)

**Problem 1:**

1. **Collider**  
     
    Example 1:

|  |
| --- |
|  |

Example 2:

|  |
| --- |
|  |

**Trigger**  
  
 Example 1:

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| --- |
|  |

Example 2:

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| --- |
|  |

1. Express p[i] as an affine combination of a, b, and c:

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| --- |
|  |

1. How many degrees to achieve a 90 degree rotation over 4 seconds:

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| --- |
|  |

**Problem 2:**

1. Compute u and v from p, q, and c:

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| --- |
|  |

1. Compute t:

|  |
| --- |
|  |

1. Compute t’:

|  |
| --- |
|  |

1. Collision test for the colliders (math notation):

|  |
| --- |
|  |

1. Collision test for the colliders (in C#):

|  |
| --- |
| bool SphereCapsuleCollide(Vector3 c, float r, Vector3 p,  Vector3 q, float s) { |

**Problem 3:**

Select one: Right-handed Left-handed

1. Compute basis vectors u, f, and r (math notation):

|  |
| --- |
|  |

1. Compute basis vectors u, f, and r (C#):

|  |
| --- |
| void PlayerFrame(Vector3 c, float s, Vector3 p, Vector3 q,  out Vector3 u, out Vector3 f, out Vector3 r) { |

**Problem 4:**

1. Derive the fractal dimension of the boundary of S\*:

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| --- |
|  |

1. Give an L-System for S\*:  
   1. Step size d, angle increment δ, and (optional) starting angle for level i:

|  |
| --- |
|  |

* 1. Variables and their meanings:

|  |
| --- |
|  |

* 1. Start string ω:

|  |
| --- |
|  |

* 1. Production rule(s) P:

|  |
| --- |
|  |

**Problem 5:**

1. Local pose transformations:

|  |  |
| --- | --- |
| T[c←d] = | T[b←c] = |
| T[a←b] = |  |



|  |
| --- |
| T[a←d] = T[a←b] T[b←c] T[c←d] = |

|  |
| --- |
| T[a←d] p[d] = |

**Extra space:** (if needed)