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:
  (a) **Collider**

        Example 1:

        Example 2:

Trigger

Example 1:

Example 2:

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

(c) How many degrees to achieve a 90 degree rotation over 4 seconds:

Problem 2:

(a) Compute u and v from p, q, and c:

(b) Compute t:

(c) Compute t':

(d) Collision test for the colliders (math notation):

(e) Collision test for the colliders (in C#):

```csharp
bool SphereCapsuleCollide(Vector3 c, float r, Vector3 p,
  Vector3 q, float s) {



}
```

Problem 3:
Select one: ☐ Right-handed   ☐Left-handed

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

(b) 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:
   (a) Derive the fractal dimension of the boundary of S*:

(b) Give an L-System for S*:

    i.   Step size d, angle increment δ, and (optional) starting angle for level i:

    ii.   Variables and their meanings:

    iii.   Start string ω:

    iv.   Production rule(s) P:

Problem 5:

(a) Local pose transformations:

$T_{[c \leftarrow d]} =$	$T_{[b \leftarrow c]} =$
$T_{[a \leftarrow b]} =$	

(b)

$T_{[a \leftarrow d]} = T_{[a \leftarrow b]} \, T_{[b \leftarrow c]} \, T_{[c \leftarrow d]} =$

$T_{[a \leftarrow d]} \, p_{[d]} \;=$

Extra space: (if needed)