

COT 4521-001: Introduction to Computational Geometry (Fall 2019)

Worksheet 1

1 Ground Rules

This assignment is intended to be done alone. You may ask others for high-level help. However, the answer must be yours. For all questions we expect you to show your work!

2 Assignment

1. Determine the orientation (clockwise or counterclockwise) of the following triangles.

- $\{\{2, 3\}, \{5, 6\}, \{3, 5\}\}$
- $\{\{3, 2\}, \{1, 6\}, \{4, 4\}\}$
- $\{\{1, 3\}, \{5, 9\}, \{3, 6\}\}$
- $\{\{1, 4\}, \{5, 6\}, \{9, 8\}\}$

2. Calculate the angle between the following 2 vectors using the:

$$A = \langle 8, 2 \rangle; B = \langle 6, 5 \rangle$$

- difference between 2 angles approach
- dot product approach
- cross product approach

3. Perform the following linear interpolations.

- $A = \{2, 3\}; B = \{5, 6\}; \alpha = 0.4$
- $A = \{1, 6\}; B = \{4, 4\}; \alpha = 0.7$
- $A = \{3, 6\}; B = \{5, 9\}; \alpha = 0.2$

4. Does $2^{n+1} = O(2^n)$? If not, what does it equal?

5. Does $2^{2n} = O(2^n)$? If not, what does it equal?

6. Prove by mathematical induction that the following formula, $3^2 + 3^3 + \dots + 3^n = 9 \left(\frac{3^{n-1} - 1}{2} \right)$, holds for $\forall n \geq 2$.

3 Submission

Upload your answers and associated work to canvas as a single scanned, typed, or photographed PDF document. Be sure that your submission is legible.