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 yours work!

2 Assignment

1. Determine whether the orientation 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:

$$A =< 8, 2 >; B =< 6, 5 >$$

   - 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, $3^2 + 3^3 + ...3^n = 9 \left(\frac{3^{n-1}-1}{2} \right)$, holds for $\forall \geq 2$.

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.