

CPSC 314

Theory Assignment 1

Due Wed, Sept 23rd, in class

Answer the questions in the spaces provided on the question sheets. If you run out of room for an answer, continue on the back of the page.
By handing this assignment in, you accept the course plagiarism policy as stated at <http://www.ugrad.cs.ubc.ca/~cs314/Vjan2013/cheat.html>.

Name: _____ **Buyun Wang**

Student Number: _____ **51988137**

Question 1	/ 1
Question 2	/ 1
Question 3	/ 1
Question 4	/ 1
Question 5	/ 1
TOTAL	/ 5

1. (1 point) Vectors

$$a = \begin{pmatrix} 2 \\ -5 \\ 8 \end{pmatrix} \quad b = \begin{pmatrix} -3 \\ 6 \\ 9 \end{pmatrix}$$

- compute $a \cdot b$ **$= 2*(-3) + (-5)*6 + 8*9 = -6 -30 +72 = 36$**
- compute $a^T b$ **$a^T b =$**
- compute $a \times b$ **$= \{-45-48, 8*(-3)-2*9, 12-15\} = \{-93, -42, -3\}$**
- compute $b \times a$ **$= \{48+45, 18+24, 15-12\} = \{93, 42, 3\}$**

2. (1 point) Matrices

$$A = \begin{pmatrix} 1 & -2 & 3 \\ 1 & 2 & 5 \\ -9 & 7 & 3 \end{pmatrix} \quad B = \begin{pmatrix} 3 & 1 & 5 \\ 1 & 1 & 0 \\ 9 & -1 & 1 \end{pmatrix}$$

- Compute $C = AB$.
- Does $AB = BA$?
- Given the vector a from the previous question, compute $c = Aa$.
- Given the vector a from the previous question, compute $d = a^T A$.

3. (1 point) Normals and Planes

T is a triangle in 3D with vertices $P_1 = (1, 2, 0)$, $P_2 = (1, 0, 1)$ and $P_3 = (3, 1, 0)$ (counterclockwise around the normal).

- Compute the normal to T .
- Compute the area of T .
- Compute the implicit plane equation $Ax + By + Cz + D = 0$ for the plane that T lies in.

4. (1 point) Segments and Lines

Given two segments in 2D: S_1 from $(0, 1)$ to $(-1, 3)$ and S_2 from $(0, 0)$ to $(3, 3)$,

- Does the point $P = (0, 1)$ lie on S_1 ?
- Do S_1 and S_2 intersect? If yes, compute the intersection, if no, explain.

5. (1 point) Frames

Specify the coordinates of point P with respect to coordinate frames A, B and C, and then explain the coordinate transformation process from P_A to P_B .

