

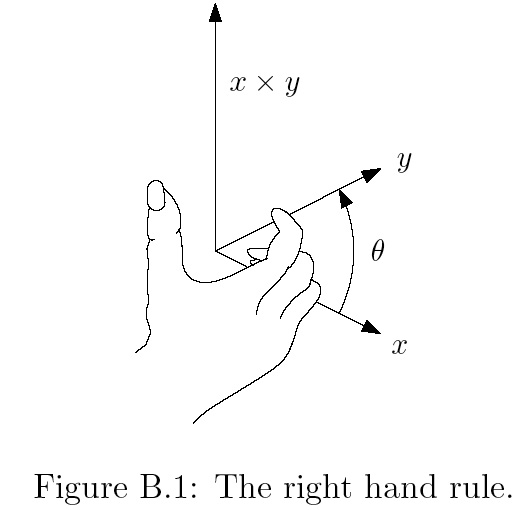
**ECE 5397/6397: Intro to Robotics**

**Class Worksheet – Lecture 2: Quiz on Vectors**

1. Let and . What is the **scalar product** ?
2. What is the **outer product** ?
3. What is the length or **norm** of vector ? That is = ?
4. Fill in the relationships

name it: *Cauchy-Schwartz inequality*

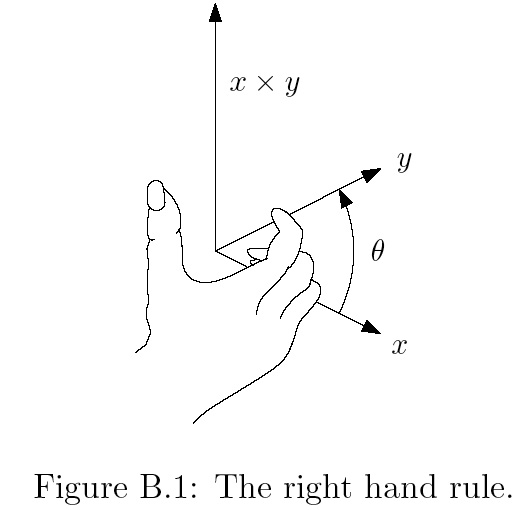
name it: *triangle inequality*

1. If , what is ?

Shortest angle between and .

1. Assume and are 2D vectors that are not parallel. Draw if
2. Again let and . What is , where is the **trace** of a matrix?
3. What is the **determinant** of

1. Give the **vector product** (the **cross product**) of two vectors and that belong to as the vector



*-y*

*-y* x *x*

1. What is ? (**anticommutative**) Draw it on image B.1:
2. Apply distributive rule: =
3. Apply distributive rule:



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**Class Worksheet – Preparation for Lecture 3**

1. Show that the length of a free vector is not changed by rotation, that is, that .
2. Show that the distance between points is not changed by rotation, that is .
3. Show that , , and imply
4. Suppose is a rotation matrix. In other words, and . Show that there exits a unique such that is of the form
5. Implement the swarmrobot outreach code at <http://www.cs.unm.edu/~elizabeth/mars_robots.zip>. You must install NetLogo on your computer: <https://ccl.northwestern.edu/netlogo/> Make a copy of the file with \_ice in the name. Create an additional global variable **numberOfIce**. Create clusters in blue to represent ice. The singly placed yellow patches will still represent rocks. You must then change the **pcolor** tests to look for both blue and yellow patches. Create separate monitors for the ice and rocks remaining to be collected. Email this file to the TA.