

Subject: Calculus

Topic: Cross Product

- Goal: Use *Mathematica* to explore the operation of cross product.

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#### Task 1

The command `Cross[vector1, vector2]` computes the cross product. Try the following:

```
Cross[{u1, u2, u3}, {v1, v2, v3}]
```

If the vectors are going to be used for additional computations, it may be a good idea to define them:

```
u = {u1, u2, u3};  
v = {v1, v2, v3};
```

And then define the cross product as a new vector:

```
w = Cross[u, v]
```

Another way to compute the cross product is by using the  $\times$  symbol, found in the Writing Assistant (under Typesetting, third tab, second operation). Verify that the operation is in fact the same:

```
u  $\times$  v
```

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#### Task 2

- Use *Mathematica* to compute the sine of the angle between the vector  $u = \langle 2, -1, 1 \rangle$  and  $v = \langle 3, 2, 1 \rangle$ .
- Use the dot product definition to compute the cosine of the angle.
- Does the sum of the squares of your answers above equal 1?
- Use the dot product operation to verify that the cross product is orthogonal to the given vectors  $u$  and  $v$ .

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Related Exercises/Notes: