7.7 Applications of the Dot and Cross Products

These problems taken from the Nelson Text: Pg. 415

2. a. Calculate $|\vec{a} \times \vec{b}|$, where $\vec{a} = (1, 2, 1)$ and $\vec{b} = (2, 4, 2)$.

3. Calculate the amount of work done in each situation.

    a. A stove is slid 3 m across the floor against a frictional force of 150 N.

    b. A 40 kg rock falls 40 m down a slope at an angle of 50° to the vertical.

    c. A wagon is pulled a distance of 250 m by a force of 140 N applied at an angle of 20° to the road.

    d. A lawnmower is pushed 500 m by a force of 100 N applied at an angle of 45° to the horizontal.

5. Calculate the area of the parallelogram formed by the following pairs of vectors:

    a. $\vec{a} = (1, 1, 0)$ and $\vec{b} = (1, 0, 1)$ b. $\vec{a} = (1, -2, 3)$ and $\vec{b} = (1, 2, 4)$

6. The area of the parallelogram formed by the vectors $\vec{p} = (a, 1, -1)$ and $\vec{q} = (1, 1, 2)$ is $\sqrt{35}$. Determine the value(s) of a for which this is true.

8. A 10 N force is applied at the end of a wrench that is 14 cm long. The force makes an angle of 45° with the wrench. Determine the magnitude of the torque of this force about the other end of the wrench.

Answers to Selected Problems

2. a. 0
    b. This makes sense because the vectors lie on the same line. Thus, the parallelogram would just be a line making its area 0.
3. a. 450 J
    b. about 10 078.91 J
    c. about 32 889.24 J
    d. 35 355.34 J

5. a. $\sqrt{3}$ square units
    b. $\sqrt{213}$ square units
6. 2, $\dfrac{-12}{5}$
8. about 0.99 J