

2.6B Find  $\vec{A} \times \vec{C}$  for:

a)  $\vec{A} = 2\hat{i} - 4\hat{j} + \hat{k}$  and  $\vec{C} = 3\hat{i} + 4\hat{j} + 10\hat{k}$

$$2\hat{i} \times 4\hat{j} + 2\hat{i} \times 10\hat{k} - 4\hat{j} \times 3\hat{i} - 4\hat{j} \times 10\hat{k} + \hat{k} \times 3\hat{i} + \hat{k} \times 4\hat{j}$$

$$+8\hat{k} - 20\hat{j} + 12\hat{k} - 40\hat{i} + 3\hat{j} - 4\hat{i}$$



$$= \boxed{-44\hat{i} - 17\hat{j} + 20\hat{k}}$$

b)  $(3\hat{i} + 4\hat{j} + 10\hat{k}) \times (2\hat{i} - 4\hat{j} + \hat{k})$

$$(3\hat{i} \times -4\hat{j}) + (3\hat{i} \times \hat{k}) + (4\hat{j} \times 2\hat{i}) + (4\hat{j} \times \hat{k}) + (10\hat{k} \times 2\hat{i}) + (10\hat{k} \times -4\hat{j})$$

$$= -12\hat{k} + -3\hat{j} + -8\hat{k} + 4\hat{i} + 20\hat{j} + 40\hat{i} + 20\hat{j} - 40\hat{i}$$

$$= \boxed{44\hat{i} + 17\hat{j} - 20\hat{k}}$$

c)  $(-3\hat{i} - 4\hat{j}) \times (-3\hat{i} + 4\hat{j})$

$$-3\hat{i} \times 4\hat{j} + -4\hat{j} \times -3\hat{i}$$

$$-12\hat{k} + -12\hat{k}$$

$$= \boxed{-24\hat{k}}$$

d)  $\overset{C=}{(-2\hat{i} + 3\hat{j} + 2\hat{k})} \times \overset{A=}{(-9\hat{j})}$  They switched the order around!

$$= (-2\hat{i} \times -9\hat{j}) + (2\hat{k} \times -9\hat{j})$$

$$= 18\hat{k} + 18\hat{i}$$

$$= \boxed{18\hat{i} + 18\hat{k}}$$

This shows that  $\vec{C} \times \vec{A} \neq \vec{A} \times \vec{C}$

Corrected solution  $\vec{A} \times \vec{C}$

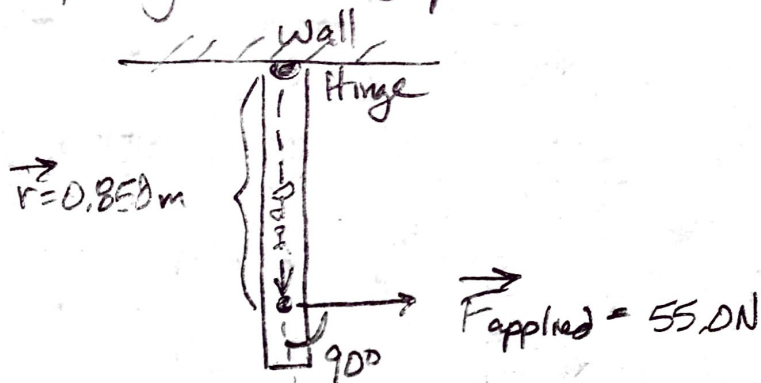
$$= (-9\hat{j}) \times (-2\hat{i} + 3\hat{j} + 2\hat{k})$$

$$= -18\hat{k} + -18\hat{i}$$

$$= \boxed{-18\hat{i} + 0\hat{j} - 18\hat{k}}$$

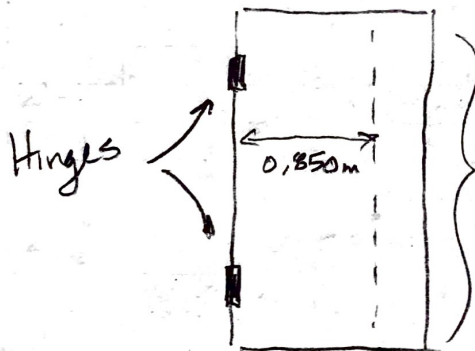
10,73

Opening a door (top view)



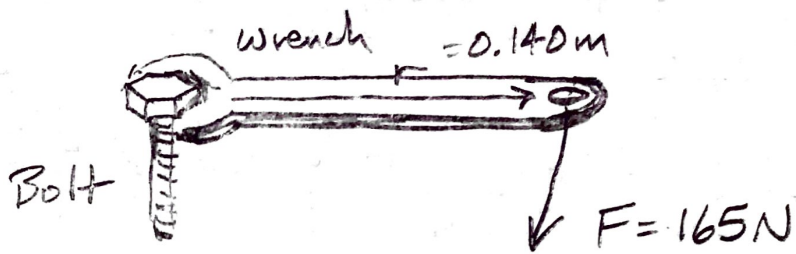
$$\begin{aligned}
 a) \quad \tau &= r \times F \\
 &= 0,850 \text{ m} \times 55 \text{ N} (\sin 90) \\
 &= \boxed{46,8 \text{ N}\cdot\text{m}}
 \end{aligned}$$

b) Front view



Applying force at any height here doesn't change the radius for calculating torque.

10.74



$$\begin{aligned}\tau &= r \times F \\ &= r F \sin \theta \\ &= (0.140\text{ m})(165\text{ N})(\sin 90) \\ \tau &= 23.1\text{ N}\cdot\text{m} \quad (\text{in the negative-}z \text{ direction})\end{aligned}$$