

12.4, number 41: Find the area of the triangle with vertices $A = (0, 0)$, $B = (-2, 3)$, and $C = (3, 1)$.

Answer: The area is

$$\begin{aligned}\frac{1}{2}|\overrightarrow{AB} \times \overrightarrow{AC}| &= \frac{1}{2} \begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ -2 & 3 & 0 \\ 3 & 1 & 0 \end{vmatrix} \\ &= \frac{1}{2} \left(\begin{vmatrix} 3 & 0 \\ 1 & 0 \end{vmatrix} \vec{i} - \begin{vmatrix} -2 & 0 \\ 3 & 0 \end{vmatrix} \vec{j} + \begin{vmatrix} -2 & 3 \\ 3 & 1 \end{vmatrix} \vec{k} \right) \\ &= \frac{1}{2} |0\vec{i} - 0\vec{j} + (-2 - 9)\vec{k}| = \boxed{\frac{11}{2}}.\end{aligned}$$