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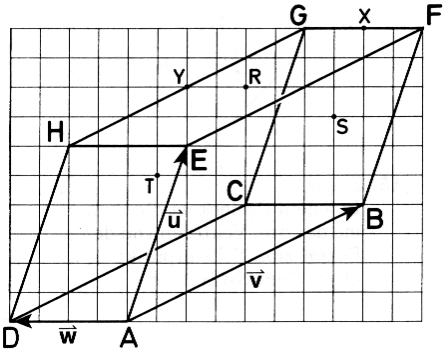

a) $\overrightarrow{AT} = \overrightarrow{w} + \frac{1}{2}(\overrightarrow{u} + \overrightarrow{v})$ $\quad \overrightarrow{HT} = \frac{1}{2}\overrightarrow{HC} = \frac{1}{2}(-\overrightarrow{u} + \overrightarrow{v})$

$\overrightarrow{AX} = \overrightarrow{v} + \overrightarrow{u} + \frac{1}{2}\overrightarrow{w}$ $\quad \overrightarrow{HX} = \overrightarrow{v} - \frac{1}{2}\overrightarrow{w}$ $\quad \overrightarrow{YD} = -\frac{1}{2}\overrightarrow{v} - \overrightarrow{u}$

b) $\overrightarrow{RS} = \overrightarrow{RX} + \overrightarrow{XS} = \frac{1}{2}\overrightarrow{v} - \frac{1}{2}\overrightarrow{u}$ $\quad \overrightarrow{YX} = \frac{1}{2}\overrightarrow{v} - \frac{1}{2}\overrightarrow{w}$

$\overrightarrow{YT} = -\frac{1}{2}\overrightarrow{u}$ $\quad \overrightarrow{XT} = \frac{1}{2}\overrightarrow{w} - \frac{1}{2}\overrightarrow{u} - \frac{1}{2}\overrightarrow{v}$ $\quad \overrightarrow{ST} = -\overrightarrow{YX} = \frac{1}{2}\overrightarrow{w} - \frac{1}{2}\overrightarrow{v}$

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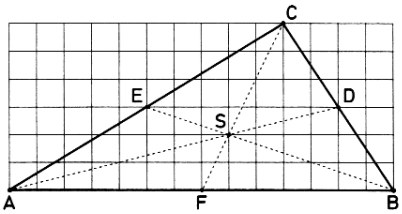

$\overrightarrow{AS} = \frac{2}{3}\overrightarrow{AD}$, $\overrightarrow{BS} = \frac{2}{3}\overrightarrow{BE}$, $\overrightarrow{CS} = \frac{2}{3}\overrightarrow{CF}$

der Schwerpunkt teilt jede Seitenhalbierende im Verhältnis 2:1

$\overrightarrow{AS} = \frac{2}{3}[\overrightarrow{a} + \frac{1}{2}\overrightarrow{BC}] = \frac{2}{3}\overrightarrow{a} + \frac{1}{3}(-\overrightarrow{a} + \overrightarrow{b}) = \frac{1}{3}(\overrightarrow{a} + \overrightarrow{b})$

$\overrightarrow{BS} = -\overrightarrow{a} + \overrightarrow{AS} = \frac{1}{3}\overrightarrow{b} - \frac{2}{3}\overrightarrow{a}$, $\quad \overrightarrow{CS} = -\overrightarrow{b} + \overrightarrow{AS} = \frac{1}{3}\overrightarrow{a} - \frac{2}{3}\overrightarrow{b}$

$\overrightarrow{AS} + \overrightarrow{BS} + \overrightarrow{CS} = \frac{1}{3}\overrightarrow{a} + \frac{1}{3}\overrightarrow{b} + \frac{1}{3}\overrightarrow{b} - \frac{2}{3}\overrightarrow{a} + \frac{1}{3}\overrightarrow{a} - \frac{2}{3}\overrightarrow{b} = \overrightarrow{o}$

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$\overrightarrow{MK} = \overrightarrow{MA} + \overrightarrow{a} + \overrightarrow{BK}$

$\overrightarrow{MA} = -\frac{1}{2}(\overrightarrow{a} + \overrightarrow{b})$

$\overrightarrow{BK} = \frac{1}{3}(\overrightarrow{BC} + \overrightarrow{BS}) = \frac{1}{3}(\overrightarrow{b} - \overrightarrow{a} + \overrightarrow{c})$

$\overrightarrow{MK} = -\frac{1}{2}\overrightarrow{a} - \frac{1}{2}\overrightarrow{b} + \overrightarrow{a} + \frac{1}{3}\overrightarrow{b} - \frac{1}{3}\overrightarrow{a} + \frac{1}{3}\overrightarrow{c} = \mathbf{\frac{1}{6}\overrightarrow{a} - \frac{1}{6}\overrightarrow{b} + \frac{1}{3}\overrightarrow{c}}$