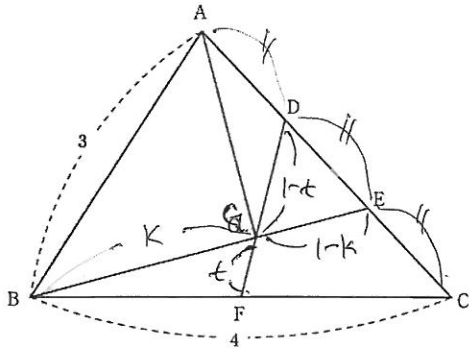$|\vec{AB}|$, $|\vec{BC}|$ 가 주어졌으므로 $\vec{AG} \cdot \vec{BE} = 0$ 을 활용할 때,

나머지 벡터 들연들을 $\vec{AB}$, $\vec{BC}$ 로 나타내는 게 유리하다.

(점G는 선분FD를 $t:1-t$, 선분 BE를 $k:1-k$로 내분한다고

t, k를 설정)

$$\vec{BE} = \frac{2}{3}\vec{BC} + \frac{1}{3}\vec{BA}. \qquad \vec{BD} = \frac{1}{3}\vec{BC} + \frac{2}{3}\vec{BA}. \qquad \vec{FD} = \vec{FB} + \vec{BD} = -\frac{1}{2}\vec{BC} + \frac{1}{3}\vec{BC} + \frac{2}{3}\vec{BA} = -\frac{1}{6}\vec{BC} + \frac{2}{3}\vec{BA}$$

$$\vec{FG} = t\vec{FD} \ (0<t<1) = -\frac{1}{6}t\vec{BC} + \frac{2}{3}t\vec{BA}. \quad \Big\} \quad \vec{BG} = \vec{BF} + \vec{FG}$$

$$\vec{BG} = k\vec{BE} \ (0<k<1) = \frac{2}{3}k\vec{BC} + \frac{1}{3}k\vec{BA} \qquad \frac{2}{3}k\vec{BC} + \frac{1}{3}k\vec{BA} = \frac{1}{2}\vec{BC} - \frac{1}{6}t\vec{BC} + \frac{2}{3}t\vec{BA}.$$

$$\therefore \ \frac{2}{3}k = \frac{1}{2} - \frac{1}{6}t \text{ 에서 } \ 4k = 3-t \ \cdots ① , \quad \frac{1}{3}k = \frac{2}{3}t \text{ 에서 } \quad k = 2t \ \cdots ②$$

①, ② 에서 $t = \frac{1}{3}$, $k = \frac{2}{3}$, $\therefore$ 점G는 선분BE를 $2:1$ 로 내분한다.

$$\therefore \ \vec{AG} = \frac{1}{3}\vec{AB} + \frac{2}{3}\vec{AE} = \frac{1}{3}\vec{AB} + \frac{4}{9}\vec{AC} = \frac{7}{9}\vec{AB} + \frac{4}{9}\vec{BC}, \qquad \vec{BE} = -\frac{1}{3}\vec{AB} + \frac{2}{3}\vec{BC}.$$

$$\vec{AG} \cdot \vec{BE} = -\frac{7}{27}|\vec{AB}|^2 + \frac{10}{27}\vec{AB} \cdot \vec{BC} + \frac{8}{27}|\vec{BC}|^2 = -\frac{63}{27} + \frac{10}{27}\vec{AB} \cdot \vec{BC} + \frac{128}{27} = 0$$

$$\therefore \ \vec{AB} \cdot \vec{BC} = -\frac{65}{10} = -\frac{13}{2}.$$

$$|\vec{AC}|^2 = 9 + 16 - 2 \cdot 3 \cdot 4 \cdot \cos(\angle ABC) = \left(|\vec{AB} + \vec{BC}|\right)^2 = 9 + 16 + 2 \cdot \vec{AB} \cdot \vec{BC}$$

$$\therefore \ -24 \cdot \cos(\angle ABC) = -13 \text{ 에서 } \quad \cos(\angle ABC) = \frac{13}{24} \ /\!/$$

※ $\vec{AB} \cdot \vec{BC} = -\frac{13}{2}$ 에서 $|\vec{AB}| \cdot |\vec{BC}| \cdot \cos(\angle ABC) = 12\cos(\angle ABC)$

$\therefore \ \cos(\angle ABC) = \frac{13}{24} \ /\!/$ $\ (\because \vec{AB} \cdot \vec{BC} = -\frac{13}{2}$ 이면 $\vec{BA} \cdot \vec{BC} = \frac{13}{2}$ 이다)