HW4 Q3

$$f = uvy + vwy + xy + uz + vz$$

$$g = uxy + xz + uvz + vwz + yz$$

First, let us evaluate Kernel / Co-Kernel pairs

$$\frac{K_f}{Co\text{-}K} = \left\{ \frac{vy+z}{u}, \frac{uy+wy+z}{v}, \frac{(u+w)}{vy}, \frac{uv+vw+x}{y}, \frac{u+v}{z}, \frac{f}{1} \right\}$$

$$\frac{K_g}{Co\text{-}K} = \left\{ \frac{vz+xy}{u}, \frac{u+w}{vz}, \frac{uy+z}{x}, \frac{ux+z}{y}, \frac{uv+vw+x+y}{z}, \frac{g}{1} \right\}$$

Both f and g have common co-K, and common subexpressions from Kernels. Common Co-Kernels are only single literals. Extracting single literal co-Kernels won't reduce literal cost. So, find common subexpressions from Kernels.

3 common expressions $= K_f \cap K_g = \left\{ \begin{matrix} u+w \\ uy+z \end{matrix}, uv + vw + x \right\}$

should we use this one, extract more cubes?

Divide $f / \underbrace{uv + vw + x}$ & $g / \underbrace{uv + vw + x}$

↳ call this h

1st iteration

$$\begin{aligned} f &= y(h) + uz + vz \\ g &= uxy + z\cdot(h) + yz = z\cdot(h) + uxy + yz \\ h &= uv + vw + x. \end{aligned}$$

f & g are of the form Q.D. + R and in SOP form. Factorize to expose more co-K/K.

$$\left.\begin{aligned} f &= y\cdot(h) + z(u+v) \\ g &= z\cdot h + y(ux+z) \\ h &= v(u+w) + x \end{aligned}\right) \text{ 15 literals.}$$

Now, also try to divide f, g by $\underbrace{uy + z} = h$

$\cancel{f = vwy + v\cdot h + uz + xy = y(vw+x) + vh + uz}$

$\cancel{g = vz(u+w) + x\cdot h + yz = z(y + v(u+z))}$

$\cancel{h = uy + z}$

~~Divide~~ $\cancel{f/(uv+vw+x)}$, $\cancel{g/(uv+vw+x)}$

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$$\begin{cases} f = v\cdot(h) + vwy + uz + xy \\ g = x\cdot h + vz(w+u) + yz \\ h = uy + z. \end{cases}$$

factorize further.

$$\left.\begin{aligned} f &= v(h+wy) + uz + xy \\ g &= xh + z\left[v(w+u) + y\right] \\ h &= uy + z \end{aligned}\right\} \text{18 literals.}$$

In this case greedy extraction worked.