$$y = h(x_1, x_2) = x_1 \cdot x_2$$

$$
\begin{aligned}
y_A = h_A(x_1, x_2) &= fl(x_1) \odot f(x_2) \\
&= x_1(1+\alpha) \odot x_2(1+\beta) \\
&= x_1 \cdot x_2 (1+\alpha)(1+\beta)(1+\gamma) \\
&= \left| \frac{x_1 \cdot x_2 (1+\alpha)(1+\beta)(1+\gamma) - x_1 \cdot x_2}{x_1 \cdot x_2} \right| \\
&= |(1+\alpha)(1+\beta)(1+\gamma) - 1| = O(\varepsilon_{mach})
\end{aligned}
$$

$$\downarrow$$

$$\underline{\delta x_1} = x_1[(1+\alpha)(1+\beta)(1+\gamma) - 1]$$

$$\underline{\delta x_2} = x_2[(1+\alpha)(1+\beta)(1+\gamma) - 1]$$

$$
\begin{aligned}
h_A x_1 &= x_2 \cdot x_1 (1+\alpha)(1+\beta)(1+\gamma) \\
&= x_2 [x_1(1+\alpha)(1+\beta)(1+\gamma) - x_1 + x_1] \\
&= x_2 (x_1 + \delta x_1) \\
&= \underline{h(x_1 + \delta x_1)}
\end{aligned}
$$

$$
\begin{aligned}
h_A x_2 &= x_1 \cdot x_2 (1+\alpha)(1+\beta)(1+\gamma) \\
&= x_1 [x_2(1+\alpha)(1+\beta)(1+\gamma) - x_2 + x_2] \\
&= x_1 (x_2 + \delta x_2) \\
&= \underline{h(x_2 + \delta x_2)}
\end{aligned}
$$

$$
\begin{aligned}
\left| \frac{\delta x_1}{x_1} \right| &= \left| \frac{\cancel{x_1}[(1+\alpha)(1+\beta)(1+\gamma) - 1]}{\cancel{x_1}} \right| \\
&= (1+\alpha)(1+\beta)(1+\gamma) - 1
\end{aligned}
$$

$$O(\varepsilon_{mach}) = (1+\alpha)(1+\beta)(1+\gamma) - 1 \quad \boxed{\checkmark}$$

$$
\begin{aligned}
\left| \frac{\delta x_2}{x_2} \right| &= \left| \frac{\cancel{x_2}[(1+\alpha)(1+\beta)(1+\gamma) - 1]}{\cancel{x_2}} \right| \\
&= (1+\alpha)(1+\beta)(1+\gamma) - 1
\end{aligned}
$$

$$O(\varepsilon_{mach}) = (1+\alpha)(1+\beta)(1+\gamma) - 1 \quad \boxed{\checkmark}$$

$$h_A(x_1, x_2) = h(x_1 + \delta x_1, x_2 + \delta x_2)$$

$$h_A x_1 = h(x_1 + \delta x_1) \qquad h_A x_2 = (x_2 + \delta x_2)$$

$$h(x_1 + \delta x_1, x_2 + \delta x_2) = h(x_1 + \delta x_1, x_2 + \delta x_2) \quad \boxed{\checkmark}$$