2. If $\lim_{x\to c} f(x) = L$ and $\lim_{x\to c} g(x) = M$

For any $\varepsilon > 0$, there exists $\delta_1 > 0$ and $\delta_2 > 0$, such that

$0 < |x-c| < \delta_1 \Rightarrow \quad |f(x) - L| < \frac{\varepsilon}{6}$

$0 < |x-c| < \delta_2 \Rightarrow \quad |g(x) - M| < \frac{\varepsilon}{6}$

$$\Leftrightarrow \begin{cases} -\frac{2}{3}\varepsilon < 4f(x) - 4L < \frac{2}{3}\varepsilon \\ -\frac{1}{3}\varepsilon < -2g(x) + 2M < \frac{1}{3}\varepsilon \end{cases}$$

take $\delta = \min(\delta_1, \delta_2)$

$0 < |x-c| < \delta \Rightarrow \quad -\varepsilon < 4f(x) - 2g(x) - (4L - 2M) < \varepsilon$

$$\Leftrightarrow \quad |4f(x) - 2g(x) - (4L - 2M)| < \varepsilon$$

$$\Rightarrow \lim_{x\to c} \left(4f(x) - 2g(x)\right) = 4L - 2M$$