$$b-a=\int_a^b 1\,dx = A_0\cdot 1 + A_1\cdot 1 + A_2\cdot 1$$

$$\frac{b^2-a^2}{2}=\int_a^b x\,dx = A_0\cdot a + A_1\cdot (a+2h) + A_2\cdot b$$

$$\frac{b^3-a^3}{3}=\int_a^b x^2\,dx = A_0\cdot a^2 + A_1\cdot (a+2h)^2 + A_2\cdot b^2$$

$$\begin{bmatrix} 1 & 1 & 1 \\ a & a+2h & b \\ a^2 & (a+2h)^2 & b^2 \end{bmatrix}\begin{bmatrix} A_0 \\ A_1 \\ A_2 \end{bmatrix} = \begin{bmatrix} b-a \\ \frac{b^2-a^2}{2} \\ \frac{b^3-a^3}{3} \end{bmatrix}$$

$b^2-a^2=(b-a)(b+a)$

$$\begin{bmatrix} 1 & 1 & 1 \\ 0 & 2h & b-a \\ 0 & 4ah+4h^2 & b^2-a^2 \end{bmatrix} = \begin{bmatrix} b-a \\ \frac{b^2-a^2}{2} - a(b-a) = \overbrace{\frac{b-a}{2}(b+a-2a)}^{\frac{(b-a)^2}{2}} \\ \frac{b^3-a^3}{3} - a^2(b-a) = \end{bmatrix}$$

$$\frac{b-a}{3}(\overbrace{b^2+ab+a^2-3a^2}^{b^2+ab-2a^2})$$

$$\begin{bmatrix} 1 & 1 & 1 \\ 0 & b-a & 2h \\ 0 & 0 & \underbrace{4ah+4h^2-2h(b+a)} \end{bmatrix}\begin{bmatrix} A_0 \\ A_2 \\ A_1 \end{bmatrix} \quad \begin{bmatrix} b-a \\ \frac{(b-a)^2}{2} \\ \underbrace{\frac{b-a}{3}(b^2+ab-2a^2) - \frac{(b-a)^2}{2}(a+b)} \end{bmatrix}$$

$2h = 2\frac{b-a}{3}$

$$2h\left(2a+2h-(a+b)\right)$$

$$2h\left(2a+2\frac{b-a}{3}-a-b\right)$$

$$\underbrace{2\frac{b-a}{3}\left(\frac{\overbrace{6a+2b-2a-3a-3b}^{a-b}}{3}\right)}_{\frac{2}{9}(b-a)^2}$$

$$\underbrace{\frac{b-a}{6}\left(\cancel{2b^2}+2ab-4a^2-\cancel{3b^2}+\cancel{3a^2}\right)}_{\frac{(a-b)^3}{6}}$$

$2ab-b^2-a^2$

$-(a-b)^2$

$$A_1\cdot\frac{2}{9}(b-a)^2 = \frac{(a-b)^3}{6} \Rightarrow A_1 = \frac{(a-b)\,9}{12} = \frac{3(a-b)}{4}$$

$$A_2\cdot\cancel{(b-a)} + A_1\cdot 2\frac{\cancel{(b-a)}}{3} = \frac{(b-a)^{\cancel{2}}}{2}$$

$$A_2 = \frac{b-a}{2} - \frac{2}{3}A_1 = \frac{b-a}{2} - \frac{\cancel{2}}{\cancel{3}}\cdot\frac{\cancel{3}}{\cancel{4}}\,{}^{1/2}(a-b)$$

$$= \frac{b-a}{2} + \frac{b-a}{2} = \boxed{b-a}$$

$$\overbrace{A_0 + A_1}^{\frac{3}{4}(a-b)} + \overbrace{A_2}^{b-a} = b-a \Rightarrow \boxed{A_0 = -\frac{3}{4}(b-a)}$$