4.) $\int_0^h f(t)\,dt$, $l_0 = h$, $l_1 = \frac{h}{2}$

$m_0 = 1$, $m_1 = 2$

$$T_{m_0} = \frac{h}{2}\left(f(0) + f(h)\right)$$

$$T_{m_1} = \frac{h}{4}\left(f(0) + 2f\left(\frac{h}{2}\right) + f(h)\right)$$

$$T = \alpha_0 T_{m_0} + \alpha_1 T_{m_1}$$

$$\alpha_0 = \frac{l_1^2}{l_1^2 - l_0^2} = -\frac{1}{3} \qquad \alpha_1 = -\frac{l_0^2}{l_1^2 - l_0^2} = \frac{4}{3}$$

$$T = -\frac{1}{3}\cdot\frac{h}{2}\left(f(0) + f(h)\right) + \frac{4}{3}\cdot\frac{h}{4}\left(f(0) + 2f\left(\frac{h}{2}\right) + f(h)\right)$$

$$= \frac{h}{6}\left(f(0) + f(h)\right) + \frac{2h}{3} f\left(\frac{h}{2}\right)$$

$$= h\left(\frac{1}{6}f(0) + \frac{4}{6}f\left(\frac{h}{2}\right) + \frac{1}{6}f(h)\right) \qquad \square$$