1) $I = \int_a^b f(x)\,dx \cong \int_a^b p_1(x)\,dx = \frac{b-a}{2}\left(f(a) + f(b)\right)$

$\Omega = \left\{(a, f(a)), (b, f(b))\right\}$

$f(x) \approx p_1(x) = \frac{x-b}{a-b} f(a) + \frac{x-a}{b-a} f(b)$

$\int_a^b p_1(x)\,dx$

$\int_a^b \frac{x-b}{a-b} f(a) + \frac{x-a}{b-a} f(b)\,dx$

$f(a)\int_a^b \frac{x-b}{a-b}\,dx + f(b)\int_a^b \frac{x-a}{b-a}\,dx$

$\frac{f(a)}{a-b}\int_a^b x-b\,dx + \frac{f(b)}{b-a}\int_a^b x-a\,dx$

$\frac{f(a)}{a-b}\left(\frac{1}{2}x^2 - bx\right)\Big|_a^b + \frac{f(b)}{b-a}\left(\frac{1}{2}x^2 - ax\right)\Big|_a^b$

$\frac{f(a)}{a-b}\left(\left(\frac{b^2}{2} - b^2\right) - \left(\frac{a^2}{2} - ab\right)\right) + \frac{f(b)}{b-a}\left(\left(\frac{b^2}{2} - ab\right) - \left(\frac{a^2}{2} - a^2\right)\right)$

$\frac{f(a)}{a-b}\left(\frac{-b^2}{2} - \frac{a^2}{2} + ab\right) + \frac{f(b)}{b-a}\left(\frac{b^2}{2} - ab + \frac{a^2}{2}\right)$

$\frac{f(a)}{a-b}\left(-\frac{(a-b)^2}{2}\right) + \frac{f(b)}{b-a}\left(\frac{(a-b)^2}{2}\right)$

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

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

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