

$$f(x) \approx P_1(x) = \frac{x-b}{a-b}f(a) + \frac{x-a}{b-a}f(b)$$

$$I = \int_a^b f(x)dx \cong \int_a^b P_1(x)dx$$

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

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

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

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

$$I = \frac{1}{a-b} \int_a^b ((x-b)f(a) - (x-a)f(b)) dx$$

$$I = \frac{1}{a-b} \int_a^b ((x-b)f(a) - (x-a)f(b)) dx$$

$$I = \frac{1}{a-b} \int_a^b f(a)x - f(a)a - f(b)x + f(b)a dx$$

$$I = \frac{1}{a-b} \int_a^b f(a)x - f(a)b - f(b)x + f(b)a dx$$

$$I = \frac{1}{a-b} \int_a^b (f(a) - f(b))x - f(a)b + f(b)a dx$$

$$I = \frac{1}{a-b} \left[(f(a) - f(b)) \frac{x^2}{2} + (f(a)b - f(b)a) x \right]_a^b$$

$$I = \frac{1}{a-b} \left[(f(a) - f(b)) \left(\frac{b^2 - a^2}{2} \right) + (f(a)b - f(b)a) (b - a) \right]$$

$$I = \frac{1}{a-b} \left[(f(a) - f(b)) \left(\frac{(b-a)(b+a)}{2} \right) + (f(a)b - f(b)a) (b - a) \right]$$

$$I = \frac{1}{a-b} \left[b - a \left((f(a) - f(b)) \left(\frac{(b+a)}{2} \right) + (f(a)b - f(b)a) \right) \right]$$

$$I = - \left[\left((f(a) - f(b)) \left(\frac{(b+a)}{2} \right) + (f(a)b - f(b)a) \right) \right]$$

$$I = \left[\left(\frac{(f(b) - f(a)) (b+a)}{2} + (f(a)b - f(b)a) \right) \right]$$

$$I = \frac{(f(b) - f(a)) (b+a) + 2(f(a)b - f(b)a)}{2}$$

$$I = \frac{f(b)b - f(a)b + f(b)a - f(a)a + 2f(a)b - 2f(b)a}{2}$$

$$I = \frac{f(a)b - f(b)a + f(b)b - f(a)a}{2}$$

$$I = \frac{f(a)b - f(b)a + f(b)b - f(a)a}{2}$$

$$I = \frac{f(a)b - f(a)a + f(b)b - f(b)a}{2}$$

$$I = \frac{b(f(a) + f(b)) - a(f(a) + f(b))}{2}$$

$$I = \frac{(f(a) + f(b))(b-a)}{2}$$

