B. Simple quadrature formulas

1. Midpoint rule

   - Basic rule

$$f(m)(b-a), \text{ where } m = \frac{a+b}{2}$$

   - Composite rule

$$\sum_{i=0}^{n-1} f\left(\frac{x_{i+1}+x_i}{2}\right)(x_{i+1}-x_i) + O(h^2), \text{ where } h \approx (x_{i+1}-x_i)$$

2. Trapezoid rule

   - Basic rule

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

   - Composite rule

$$h\left(\frac{1}{2}f(x_0) + \sum_{i=1}^{n-1} f(x_i) + \frac{1}{2}f(x_n)\right) - \frac{(b-a)f''(c)}{12}h^2$$

3. Simpson's rule

   - Basic rule

$$\frac{b-a}{6}(f(a)+4f(m)+f(b))$$

   - Composite rule

$$\frac{h}{3}\left(f(x_0) + 4\sum_{j=1}^{s} f(x_{2j-1}) + 2\sum_{j=1}^{s-1} f(x_{2j}) + f(x_n)\right) + O(h^4), \text{ where } n = 2s$$