Solution 21.7

Analytical solution:

$$\int_0^1 14^{2x}\,dx = \left[\frac{1}{2\ln 14}14^{2x}\right]_0^1 = 36.94501$$

(a) Trapezoidal rule (n = 1):

$$I = (1-0)\frac{1+196}{2} = 98.5 \qquad \varepsilon_t = \left|\frac{36.94501-98.5}{36.94501}\right|\times 100\% = 166.612\%$$

(b) Simpson's 1/3 rule (n = 2):

$$I = (1-0)\frac{1+4(14)+196}{6} = 42.16667 \quad \varepsilon_t = 14.134\%$$

(c) Simpson's 3/8 rule:

$$I = (1-0)\frac{1+3(5.808786+33.74199)+196}{8} = 39.45654 \quad \varepsilon_t = 6.798\%$$

(d) Boole's rule:

$$I = (1-0)\frac{7(1)+32(3.741657)+12(14)+32(52.3832)+7(196)}{90} = 37.14439 \quad \varepsilon_t = 0.5397\%$$

(e) Midpoint method:

$$I = (1-0)14 = 14 \qquad \varepsilon_t = 62.106\%$$

(f) 3-segment-2-point open integration formula:

$$I = (1-0)\frac{5.808786+33.74199}{2} = 19.77539 \qquad \varepsilon_t = 46.473\%$$

(g) 4-segment-3-point open integration formula:

$$I = (1-0)\frac{2(3.741657)-14+2(52.3832)}{3} = 32.74991 \qquad \varepsilon_t = 11.355\%$$