Solution 21.13

(a) Analytical solution:

$$\int_0^{0.6} 2e^{-1.5x}dx = \left[-1.33333e^{-1.5x}\right]_0^{0.6} = -0.54209 - (-1.33333) = 0.79124$$

(b) Trapezoidal rule

$$I = (0.05-0)\frac{2+1.8555}{2} + (0.15-0.05)\frac{1.8555+1.597}{2} + (0.25-0.15)\frac{1.597+1.3746}{2}$$
$$+ (0.35-0.25)\frac{1.3746+1.1831}{2} + (0.475-0.35)\frac{1.1831+0.9808}{2}$$
$$+ (0.6-0.475)\frac{0.9808+0.8131}{2} = 0.79284$$

$$\varepsilon_t = \left|\frac{0.79124-0.79284}{0.79124}\right| \times 100\% = 0.2022\%$$

(c) Trapezoidal/Simpson's rules

$$I = (0.05-0)\frac{2+1.8555}{2} + (0.35-0.05)\frac{1.8555+3(1.597+1.3746)+1.1831}{8}$$
$$+ (0.6-0.35)\frac{1.1831+4(0.9808)+0.8131}{6} = 0.791282$$

$$\varepsilon_t = \left|\frac{0.79124-0.791282}{0.79124}\right| \times 100\% = 0.0052\%$$