Lab 4 Working

$n = 1$

$$f(x) = -\frac{1}{5}(x-4)^2 + 8$$

$$I = \int_{-1}^{8} f(x)\,dx \qquad f(-1) = 3$$

$$h = \frac{b-a}{n} \qquad h = \frac{8-(-1)}{1} = 9 \qquad f(8) = 24/5$$

$$[-1, 9]$$

Also working for single trapezoid rule

$$I1 = \frac{(b-a)}{2n}\left(f(a) + f(b)\right)$$

$$= \frac{8-(-1)}{2(1)} \times \left(3 + 24/5\right) = 35.1$$

$n = 2$

$$h = \frac{8-(-1)}{2} = 4.5$$

$$[-1, 3.5] \quad [3.5, 8] \qquad f(3.5) = \frac{159}{20}$$

$$I2 = \frac{8-(-1)}{2(2)} \times \left(3 + 2\left(\frac{159}{20}\right) + \frac{24}{5}\right)$$

$$= 53.325$$

$n = 4$

$h = \frac{8 - -1}{4} = 2.25$

$[-1, 1.25]\ [1.25, 3.5]\ [3.5, 5.75]\ [5.75, 8]$

$f(5.75) = \frac{597}{80}$

$f(1.25) = \frac{519}{80}$

$I_4 = \frac{8 - -1}{2(4)} \times \left(3 + 2\left(\frac{519}{80} + \frac{159}{20} + \frac{591}{80}\right) + \frac{24}{5}\right)$

$= 57.88125$

$n = 8$

$h = \frac{8 - -1}{8} = 1.125$

$[-1, 0.125)\ [0.125, 1.25]\ [1.25, 2.375]\ [2.375, 3.5]\ [3.5, 4.625]\ [4.625, 5.75)\ [5.75, 6.875]\ [6.875, 8]$

$I_8 = \frac{8 - -1}{2(8)} \times \left(f(-1) + 2\left(f(0.125) + f(1.25) + f(2.375) + f(3.5) + f(4.625) + f(5.75) + f(6.875)\right) + f(8)\right)$

$f(0.125) = \frac{1599}{320}$

$f(2.375) = \frac{2391}{320}$

$f(4.625) = 507/64$

$f(6.875) = 2031/320$

$= 59.0203125$