

1. $\int_0^{\pi/2} \cos x dx$ using Trapezoidal rule.

$$f(x) = \cos x$$

Range is 0 to $\pi/2$ and $n=6$

$$\therefore h = \frac{\pi/2 - 0}{6} = \frac{\pi}{12}$$

$$\therefore x \quad 0 \quad \frac{\pi}{12} \quad \frac{\pi}{6} \quad \frac{\pi}{4} \quad \frac{\pi}{3} \quad \frac{5\pi}{12} \quad \frac{\pi}{2}$$

$$f(x) \quad 1 \quad 0.96592 \quad 0.86602 \quad 0.7071 \quad 0.5 \quad 0.25982 \quad 0$$

Trapezoidal rule

$$\begin{aligned} \int_{x_0}^{x_0+nh} f(x) dx &= \frac{h}{2} [f(x_0+nh) + f(x_0) + 2[f(x_0+h) + f(x_0+2h) + \dots]] \\ &= \frac{h}{2} [1 + 0 + 2[0.96592 + 0.86602 + \dots + 0.25982]] \\ &= \frac{\pi}{24} [1 + 6.59575] \\ &= 0.316489 \pi \\ &= \underline{\underline{0.99428}} \end{aligned}$$

2. $\int_0^2 x e^x$ using Simpson's rule.

$n=8$

$$a=0 \quad b=2$$

Here the range (a, b) is $(0, 2)$ if $f(x) = x e^x$

$$h = \frac{b-a}{n} = \frac{2-0}{8} = \frac{2}{8} = \frac{1}{4} = 0.25$$

$$x \quad 0 \quad 0.25 \quad 0.5 \quad 0.75 \quad 1$$

$$y=f(x) \quad 0 \quad 0.32100 \quad 0.8243 \quad 1.5877 \quad 2.71828$$

$$x \quad 1.25 \quad 1.50 \quad 1.75 \quad 2$$

$$y \quad 4.8629 \quad 6.7225 \quad 10.0705 \quad 14.7781$$

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According to Simpson's rule.

$$\int_a^b f(x) dx = \frac{h}{3} [y_0 + y_n + 4(y_1 + y_3 + \dots) + 2(y_2 + y_4 + \dots)]$$

$$= \frac{0.25}{3} [0 + 14.77811 + 4[0.32100 + 1.5877 + 4.8629 + 10.0705] + 2[0.8248 + 2.71828 + 6.7225]]$$

$$= \frac{0.25}{3} [14.77811 + 65.3684 + 20.53016]$$

$$= \underline{\underline{8.8897}}$$