Prelim Summer 2017, Q2 5894371007989034

Part 1 $F(x) = e^{\cos(x)}$, $I = \int_0^{2\pi} F(x)\,dx$

For Trapezoidal Rule with $\boxed{N}$ subintervals

$$I \approx I_N^h = h\left[\frac{F(x_0^h) + F(x_N^h)}{2} + \sum_{j=1}^{N-1} F(x_j^h)\right]$$

For interval 0 to 2π with $\boxed{N}$ subintervals

$$h = \frac{2\pi}{N}$$

$$F(x_0^h) = F(x_N^h) \Rightarrow \frac{F(x_0^h) + F(x_N^h)}{2} = \frac{F(x_N^h) + F(x_N^h)}{2} = F(x_N^h)$$

$$I = \frac{2\pi}{N}\left[F(x_N^h) + \sum_{j=1}^{N-1} F(x_j^h)\right]$$

$$I_N = \frac{2\pi}{N}\left[\sum_{j=1}^{N} F(x_j^h)\right]$$