2) By dividing the range into ten equal parts evaluate $\int \sin x\,dx$ by Trapezoidal & Simpson's rule. Verify your answer with integration.

Sol:

Range $= (\pi - 0) = \pi$

Here $h = \frac{\pi}{10}$.

We tabulated below the values of y at different x's

x	0	$\frac{\pi}{10}$	$\frac{2\pi}{10}$	$\frac{3\pi}{10}$	$\frac{4\pi}{10}$	$\frac{5\pi}{10}$	$\frac{6\pi}{10}$
$y=\sin x$	0	0.3090	0.5878	0.8090	0.9511	1.0	0.9511

$\frac{7\pi}{10}$	$\frac{8\pi}{10}$	$\frac{9\pi}{10}$	π
0.8090	0.5878	0.3090	0

(i) By Trapezoidal rule,

$$I = \frac{\pi}{20}\{(0+0) + 2(0.3090 + 0.5878 + 0.8090 + 0.9511 + 1.0 + 0.9511 + 0.8090 + 0.5878 + 0.3090)\}$$

$= 1.9843$ nearly.

(i) By Simpson's one-third rule (since there are 11 ordinates)

$$I = \frac{1}{3}\left(\frac{\pi}{10}\right)\{(0+0) + 2(0.5878 + 0.9511 + 0.9511 + 0.5878) + 4(0.3090 + 0.8090 + 0.8090 + 0.3090)\}$$

$= 2.0009$

Note: (we cannot use Simpson's three-eighth rule since the number of intervals are not multiple of 3)