1- Bisection method $[\pi \quad 2\pi]$

$f(x) = \sin(x) - x$

1) $[\pi \quad 2\pi]$

$t = \frac{\pi + 2\pi}{2} = \frac{3\pi}{2}$

$f(\frac{3\pi}{2}) = \sin(\frac{3\pi}{2}) - \frac{3\pi}{2}$

$= -5.71$

2) $[\frac{3\pi}{2} \quad 2\pi]$

$t = \frac{\frac{3\pi}{2} + 2\pi}{2} = \frac{7\pi}{4}$

$f(\frac{7\pi}{4}) = \sin(\frac{7\pi}{4}) - \frac{7\pi}{4}$

$= -6.202$

3) $[\frac{7\pi}{4} \quad 2\pi]$

$t = \frac{\frac{7\pi}{4} + 2\pi}{2} = \frac{15\pi}{8}$

$f(\frac{15\pi}{8}) = \sin(\frac{15\pi}{8}) - \frac{15\pi}{8}$

$= -6.27$

4) $[\frac{15\pi}{8} \quad 2\pi]$

$t = \frac{\frac{15\pi}{8} + 2\pi}{2} = \frac{31\pi}{16}$

$f(\frac{31\pi}{16}) = \sin(\frac{31\pi}{16}) - \frac{31\pi}{16}$

$= -6.28$

5) $[\frac{31\pi}{16} \quad 2\pi]$

$t = \frac{\frac{31\pi}{8} + 2\pi}{2} = \frac{63\pi}{32}$

$f(\frac{63\pi}{32}) = \sin(\frac{63\pi}{32}) - \frac{63\pi}{32}$

$= -6.279$

2- Newton's Method starting point $\frac{\pi}{2}$

$f(x) = \sin(x) - x$ $\quad x_0 = \frac{\pi}{2}$

$$x_{n+1} = x_n - \frac{f(x)}{f'(x)}$$

$$x_1 = x_0 - \frac{f(x)}{f'(x)}$$

$$x_1 = 1.57 - \frac{\sin(\frac{\pi}{2}) - 1.57}{-\cos\frac{\pi}{2} - 1}$$

$$= 1$$

$$x_2 = x_1 - \frac{f(x)}{f'(x)}$$

$$= 1 - \frac{\sin 1 - 1}{-\cos 1 - 1}$$

$$= 0.655$$

$$x_3 = x_2 - \frac{f(x)}{f'(x)}$$

$$= 0.655 - \frac{\sin 0.655 - 0.655}{-\cos 0.655 - 1}$$

$$= 0.433$$

$$x_4 = x_3 - \frac{f(x)}{f'(x)}$$

$$= 0.433 - \frac{\sin 0.433 - 0.433}{-\cos 0.433 - 1}$$

$$= 0.288$$

$$x_5 = x_4 - \frac{f(x)}{f'(x)}$$

$$= 0.288 - \frac{\sin 0.288 - 0.288}{-\cos 0.288 - 1}$$

$$= 0.192$$

3- Secant method $x_0 = \pi$ $x_1 = \frac{\pi}{2}$

$f(x) = \sin(x) - x$ $x_0 = \pi$ $x_1 = \frac{\pi}{2}$

$$x_{n+1} = x_n - \frac{f(x_n) \cdot (x_n - x_{n-1})}{f(x_n) - f(x_n - x_{n-1})}$$

$$x_2 = \frac{\pi}{2} - \frac{(\sin\frac{\pi}{2} - \frac{\pi}{2}) \cdot (\frac{\pi}{2} - \pi)}{(\sin\frac{\pi}{2} - \frac{\pi}{2}) - (\sin\pi - \pi)}$$

$= 1.22$

$$x_3 = 1.22 - \frac{f(1.22) \cdot (1.22 - \frac{\pi}{2})}{f(1.22) - f(\frac{\pi}{2})}$$

$= 0.88$

$$x_4 = 0.88 - \frac{f(0.88) \cdot (0.88 - 1.22)}{f(0.88) - f(1.22)}$$

$= 0.66$

$$x_5 = 0.66 - \frac{f(0.66) \cdot (0.66 - 0.88)}{f(0.66) - f(0.88)}$$

$= 0.49$

$$x_6 = 0.49 - \frac{f(0.49) \cdot (0.49 - 0.66)}{f(0.49) - f(0.66)}$$

$= 0.37$