

Solve the following non-linear equation.

$$x \cos x - 2x^2 + 3x - 1 = 0; \quad 0.2 \leq x \leq 0.3$$

Sol:-

$$f(x) = x \cos x - 2x^2 + 3x - 1$$

$$f(x_n) = x_n \cos x_n - 2x_n^2 + 3x_n - 1$$

$$f'(x_n) = \cos x_n - x_n \sin x_n - 4x_n + 3$$

Let $n=0$

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

$$x_0 = 0.2$$

$$x_1 = 0.2 - \frac{(0.28399)}{(3.14033)}$$

$$= 0.2 + 0.09043$$

$$= 0.29043$$

Let $n=1$

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

$$x_2 = (0.29043) - \frac{f(0.29043)}{f'(0.29043)}$$

$$= 0.29043 - \frac{(-0.01914)}{2.71323}$$

$$= 0.29043 + 0.00705$$

$$= 0.29748$$

| n | x_n | $f(x_n)$ | $f'(x_n)$ | x_{n+1} |
|-----|---------|----------|-----------|-----------|
| 0 | 0.2 | -0.28399 | 3.14033 | 0.29043 |
| 1 | 0.29043 | -0.01914 | 2.71323 | 0.29748 |
| 2 | 0.29748 | | | |

$$\frac{1}{5} \quad 0.2$$

Stop when $f(x_n)$ will start become 0 or x_{n+1} will be repeating...

Exercise set 2.3 Q 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100

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