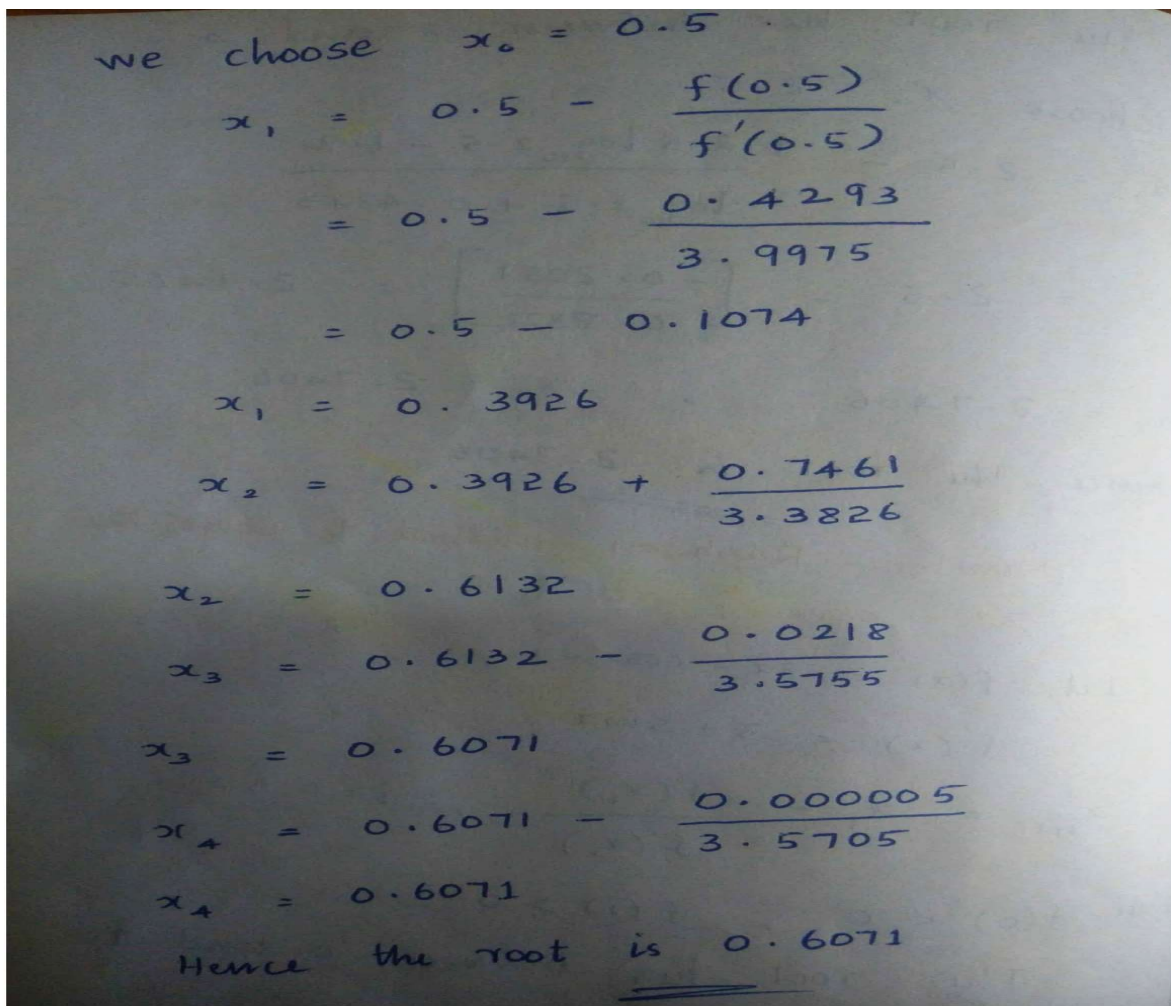
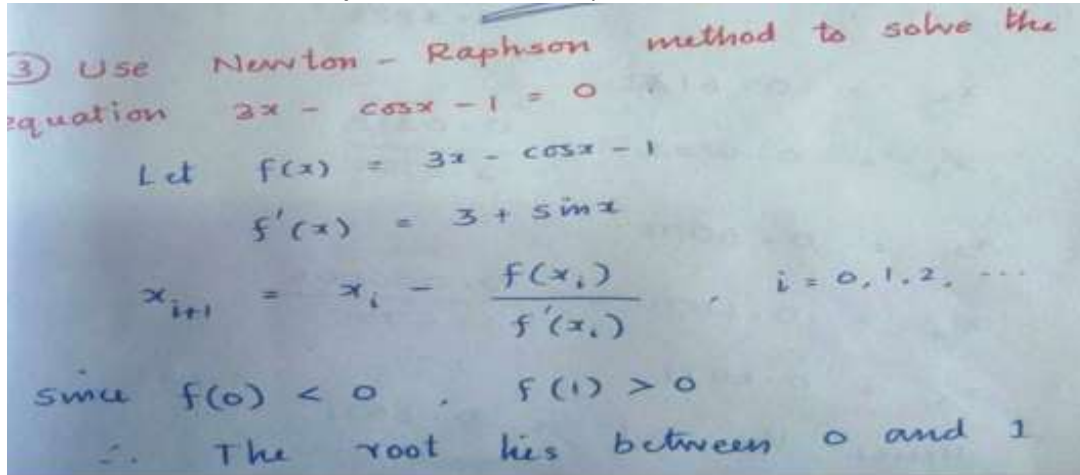




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Topic: 3.2 – Newton Raphson method





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4) Find an iterative formula to find \sqrt{N} (where N is a positive number) and hence find $\sqrt{5}$

Let $x = \sqrt{N}$

$\therefore x^2 - N = 0$ Let $f(x) = x^2 - N$

$f'(x) = 2x$

$x_{i+1} = x_i - \frac{f(x_i)}{f'(x_i)}$ $i = 0, 1, 2, \dots$

$= x_i - \frac{x_i^2 - N}{2x_i} = \frac{2x_i^2 - x_i^2 + N}{2x_i}$

$= \frac{1}{2} \left[\frac{x_i^2 + N}{x_i} \right]$

$x_{i+1} = \frac{1}{2} \left[x_i + \frac{N}{x_i} \right]$ is the iterative formula to find \sqrt{N} .

To find $\sqrt{5}$, put $N = 5$

$f(x) = x^2 - 5$; $f'(x)$

$f(0) < 0$; $f(1) < 0$; $f(2) < 0$

$f(3) > 0$



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$\therefore x$ lies between 2 and 3.

Take $x_0 = 2$

$$x_1 = \frac{1}{2} \left[2 + \frac{5}{2} \right] = 2.25$$
$$x_2 = 2.2361$$
$$x_3 = \frac{1}{2} \left[2.2361 + \frac{5}{2.2361} \right] = \frac{2.2361 + 2.2361}{2} = 2.2361$$
$$x_4 = 2.2361$$

Hence the approximate value of $\sqrt{5}$ is

2.2361

⑤ Find an iterative formula to find the reciprocal of a given number N and hence find the value of $\frac{1}{19}$ and $\frac{1}{23}$.