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# Numerical Computing

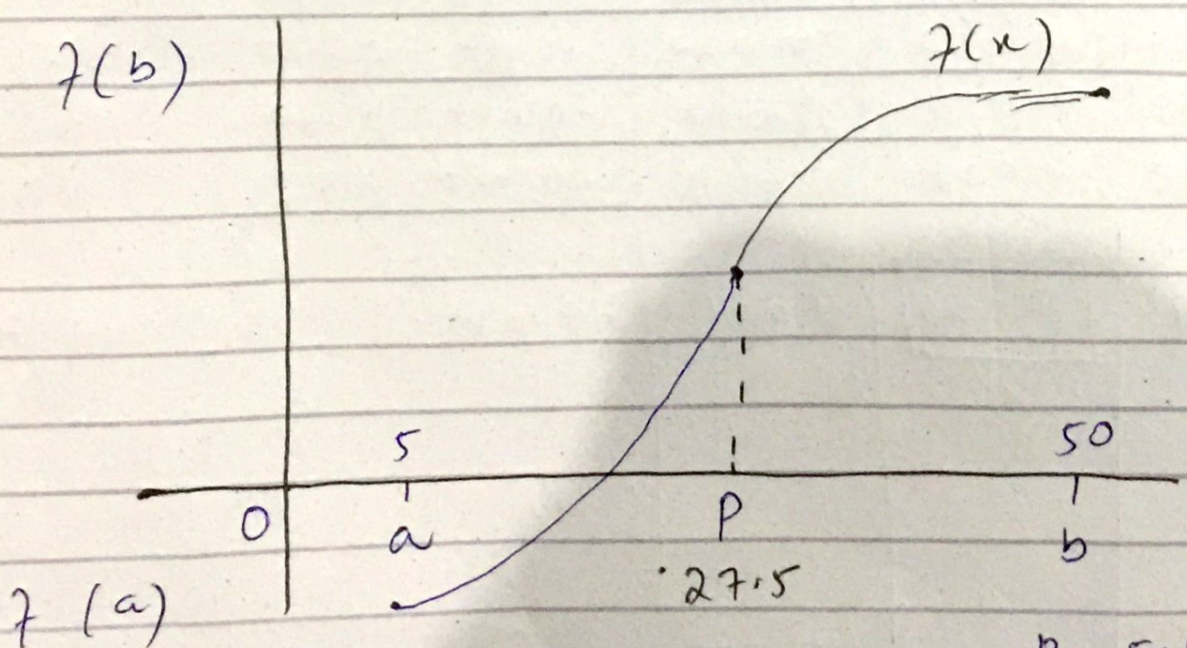
## Assignment #03:

## Topic: Root Finding

1. $F(x) = x^2 - 81$

where, $a = 5$, $b = 50$

First, we understand diagrammatically,




$f(a) = -56$, $f(b) = 2419$

∴ when we put value in eq!

$P = \frac{5+50}{2}$

$P = 27.5$

1st iteration:

$f(a) = -56$, $f(b) = 2419$

$P_1 = 27.5$

$F(P_1) = (27.5)^2 - 81 = 675.25$

2nd iteration.

$F(P_2) = ?$

$P_2 = \frac{5 + 27.5}{2} = 16.25$

$F(P_2) = (16.25)^2 - 81 = 183.0625$

3rd iteration

$P_3 = \frac{5 + 16.25}{2} = 10.625$

$F(P_3) = (10.625)^2 - 81 = 31.890$

4th iteration

$P_4 = \frac{5 + 10.625}{2} = 7.8125$

$F(P_4) = (7.8125)^2 - 81 = -19.964 < 0$

And, that's now we so on done the iterations !

## Table (for iteration)

| i | $a_n$ | $P_n$ | $b_n$ | $f(a)$ | $f(b)$ | $f(p)$ |
|---|---|---|---|---|---|---|
| 1 | 5 | 27.5 | 50 | -56 | 2419 | 675.25 |
| 2 | 5 | 16.25 | 27.5 | -56 | 675.25 | 183.062 |
| 3 | 5 | 10.625 | 16.25 | -56 | 183.062 | 31.890 |
| 4 | 5 | 7.8125 | 10.625 | -56 | 31.890 | -19.964 |
| 5 | 7.812 | 9.218 | 10.625 | -19.964 | 31.890 | 3.985 |
| 6 | 7.812 | 8.515 | 9.218 | -19.964 | 3.985 | -8.484 |
| 7 | 8.515 | 8.867 | 9.218 | -8.484 | 3.985 | -2.372 |
| 8 | 8.867 | 9.042 | 9.218 | -2.372 | 3.985 | 0.775 |
| 9 | 8.867 | 8.955 | 9.042 | -2.372 | 0.775 | -0.806 |
| 10 | 8.955 | 8.999 | 9.042 | -0.806 | 0.775 | -0.017 |
| 11 | 8.999 | 9.020 | 9.042 | -0.017 | 0.775 | 0.378 |
| 12 | 8.999 | 9.010 | 9.020 | -0.017 | 0.378 | 0.180 |
| 13 | 8.999 | 9.004 | 9.010 | -0.017 | 0.180 | 0.081 |
| 14 | 8.999 | 9.001 | 9.004 | -0.017 | 0.081 | 0.031 |
| **15** | 8.999 | **9.000** | 9.001 | -0.017 | 0.031 | 0.007 |

↑

$$P_n = 9.000$$