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Report

№: 3

MMC

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1 Fixed point

```
[fixed_point_finder] f1: x = 0.85261 |x - f(x)| = 0.00000; iterations = 102
[aitken_extrapolation] f1: x = 0.85261 |x - f(x)| = 0.00000; iterations = 4

[fixed_point_finder] f2: x = 0.71419 |x - f(x)| = 0.00000; iterations = 83
[aitken_extrapolation] f2: x = 0.71419 |x - f(x)| = 0.00000; iterations = 4

[fixed_point_finder] f3: x = 6.01550 |x - f(x)| = 0.00000; iterations = 300
[aitken_extrapolation] f3: x = 6.01550 |x - f(x)| = 0.00000; iterations = 4
```

Result 1: Fixed point iteration and Aitken method

It can be clearly seen that Aitken extrapolation converges much faster (by the number of iterations). This algorithm is used to accelerate the rate of convergence of a sequence.

Algorithm 1: fixed_point_finder()

```
x = x0;

while |x - f(x)| > tolerance:
    x = f(x);

return x;
```

Algorithm 2: aitken_extrapolation()

```
x1, x2, x3 = x0, x0, x0

do
{
    x0 = x1;
    x1 = f(x0);
    x2 = f(x1);
    λ = (x2 - x1) / (x1 - x0);
    x3 = x2 + λ/(1-λ)(x2-x1);
    x1 = x3;
} while |x3 - x2| < tolerance;

return x1;
```

Fixed point python code

2 Banking

```
Years to pay off the loan: 16
You must pay 8718.46 per year to pay off the loan in 20 year
Yearly rate must be 7.75% to pay off the loan in 20 years
```

Result 2: Banking results

For this exercise, *Newton* method was used.
Knowing the at least the basics of numerical analysis, we can solve diverse problems, that seem to be a bit complicated at first.

Banking python code