

# Newton-Raphson-Verfahren

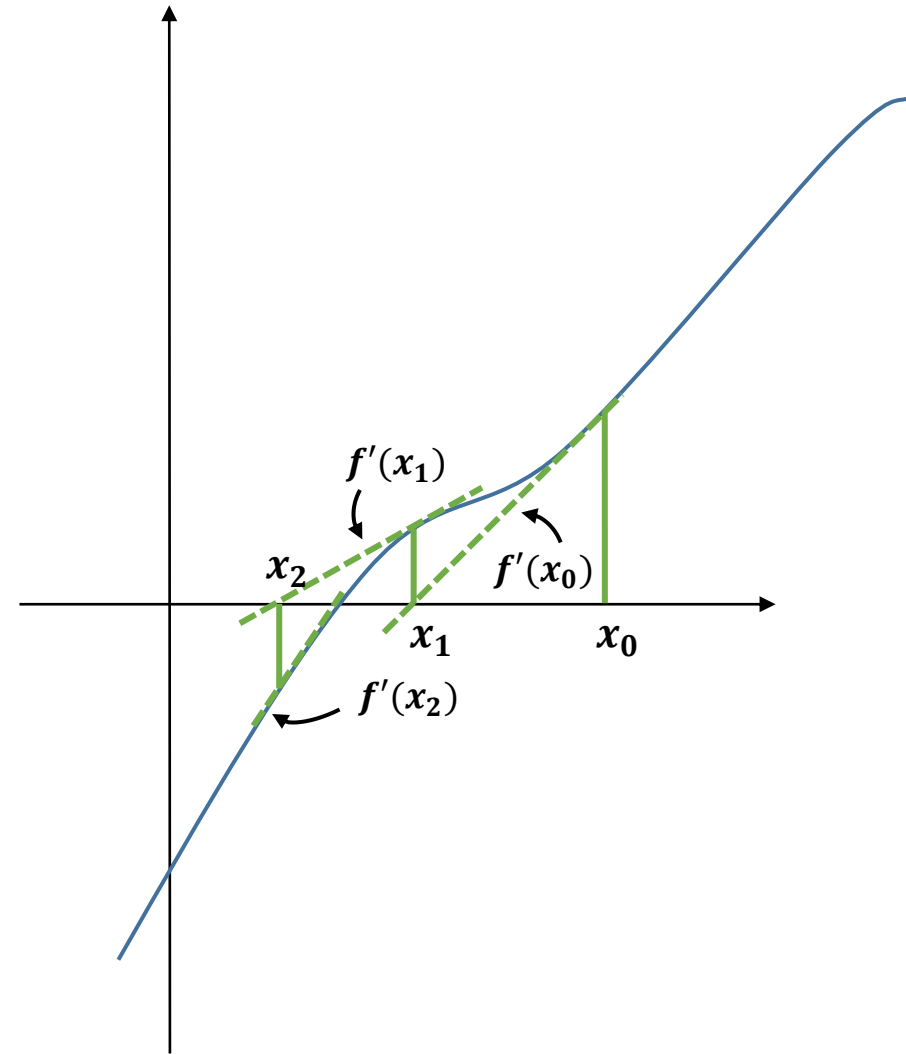
Programmieren in C | Grundlagen

# Newton-Raphson-Verfahren

$$f'(x_n) \cdot (x_n - x_{n+1}) = f(x_n) - 0$$

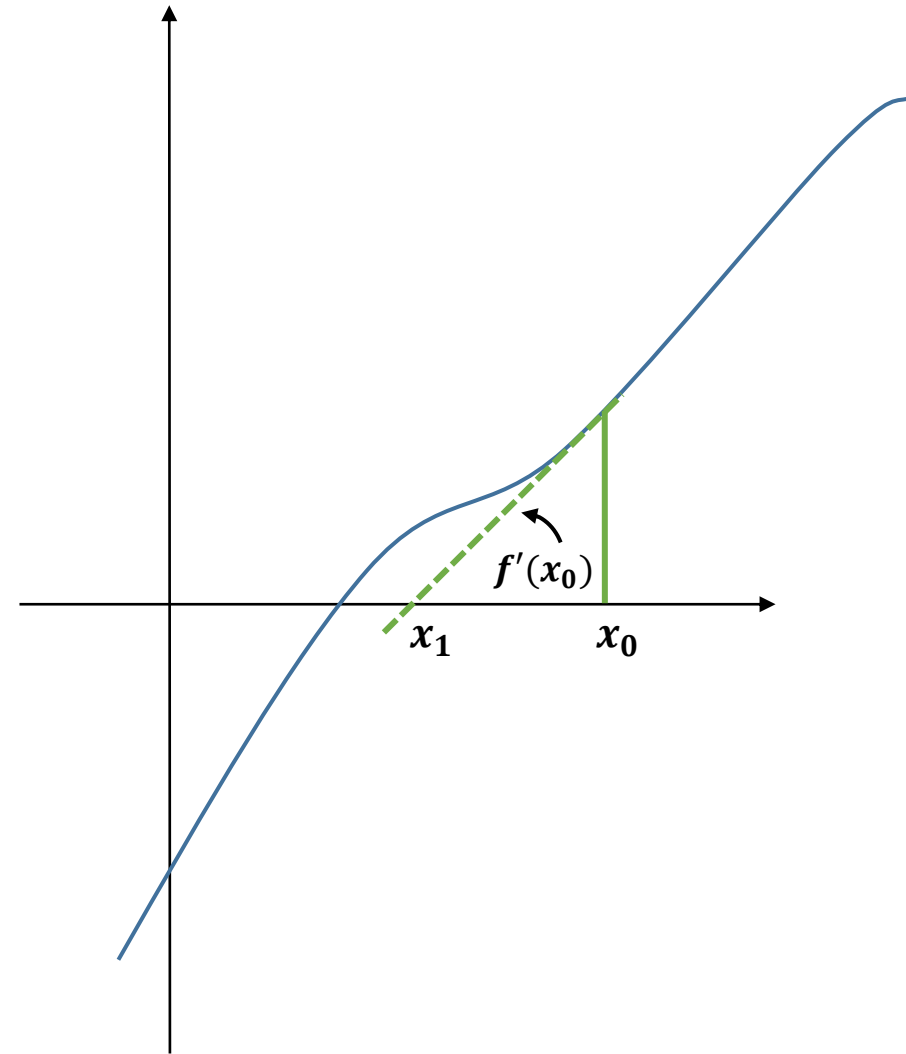
$$(x_n - x_{n+1}) = f(x_n) / f'(x_n)$$

$$x_{n+1} = x_n - f(x_n) / f'(x_n)$$



# Newton-Raphson-Verfahren

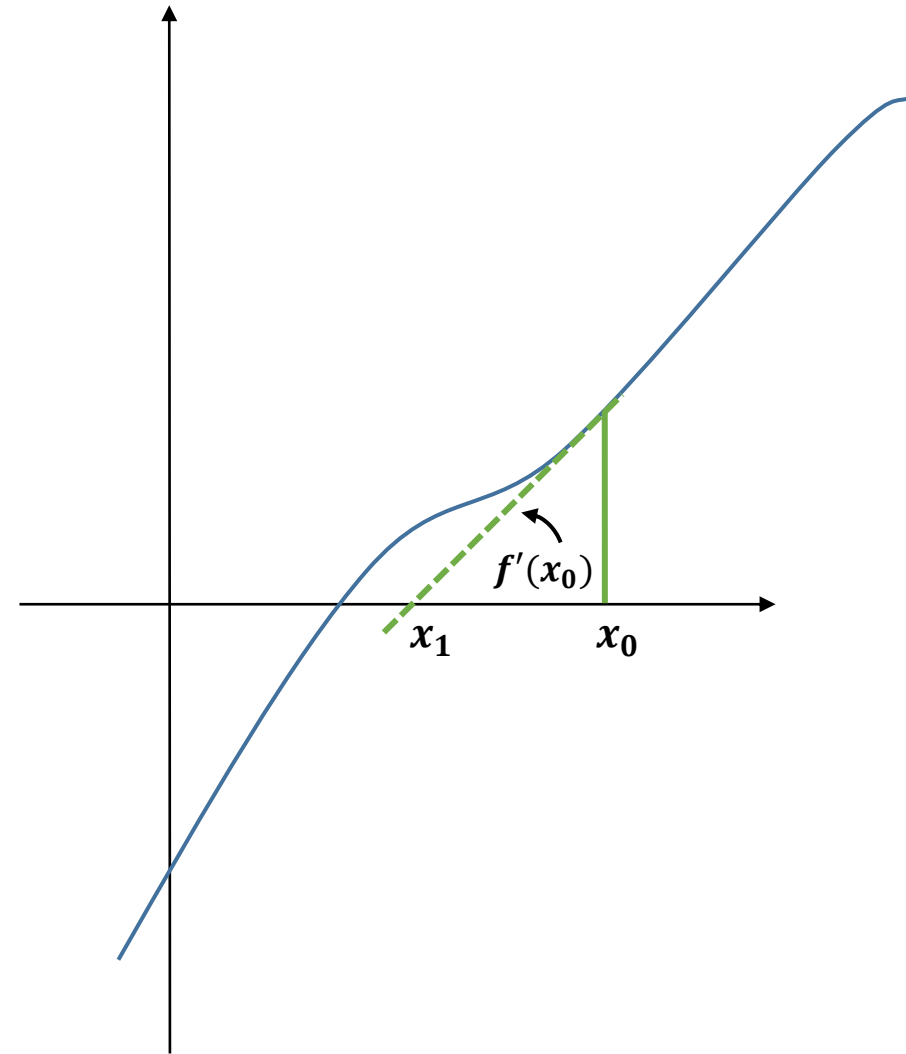
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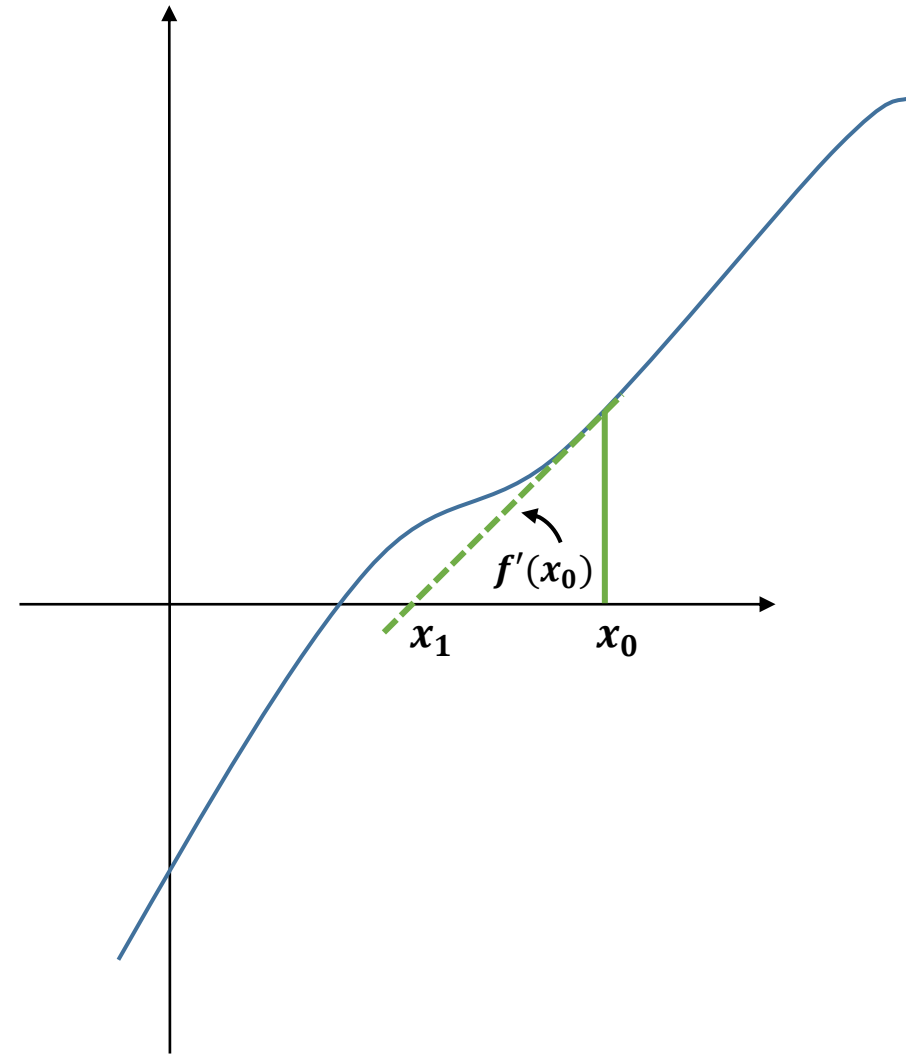


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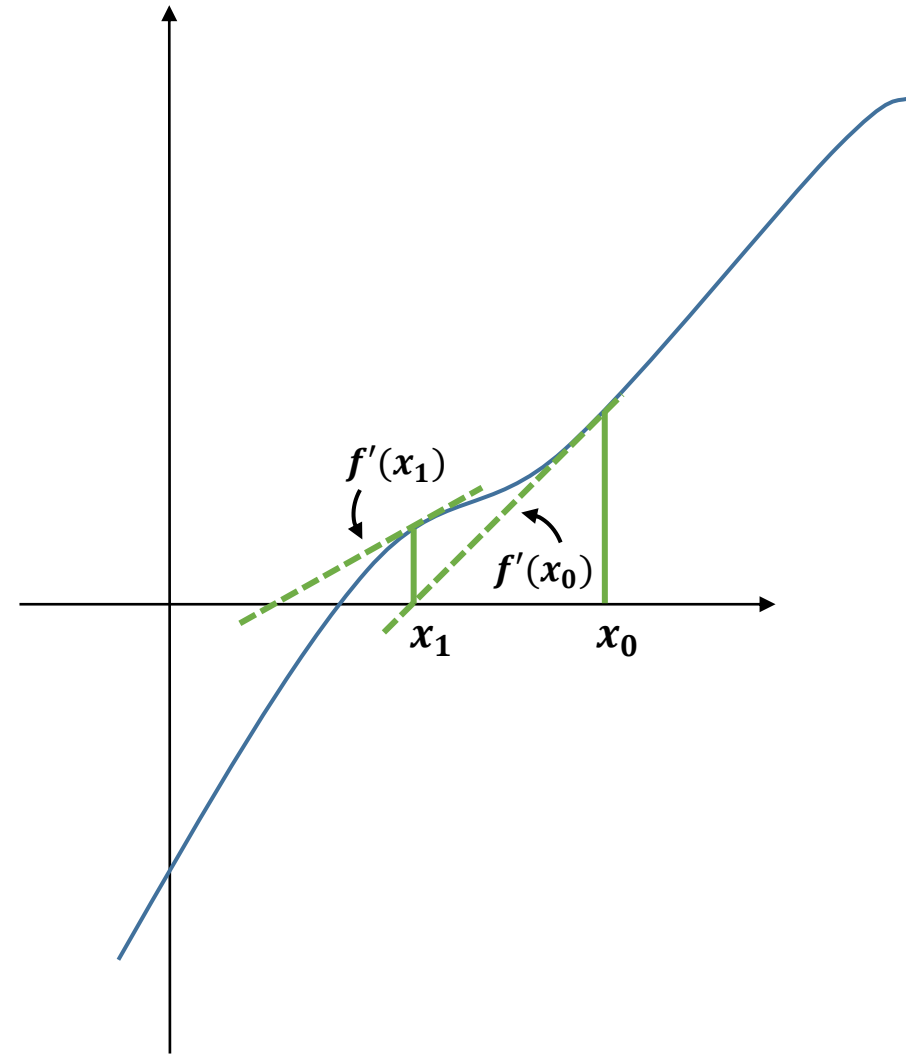


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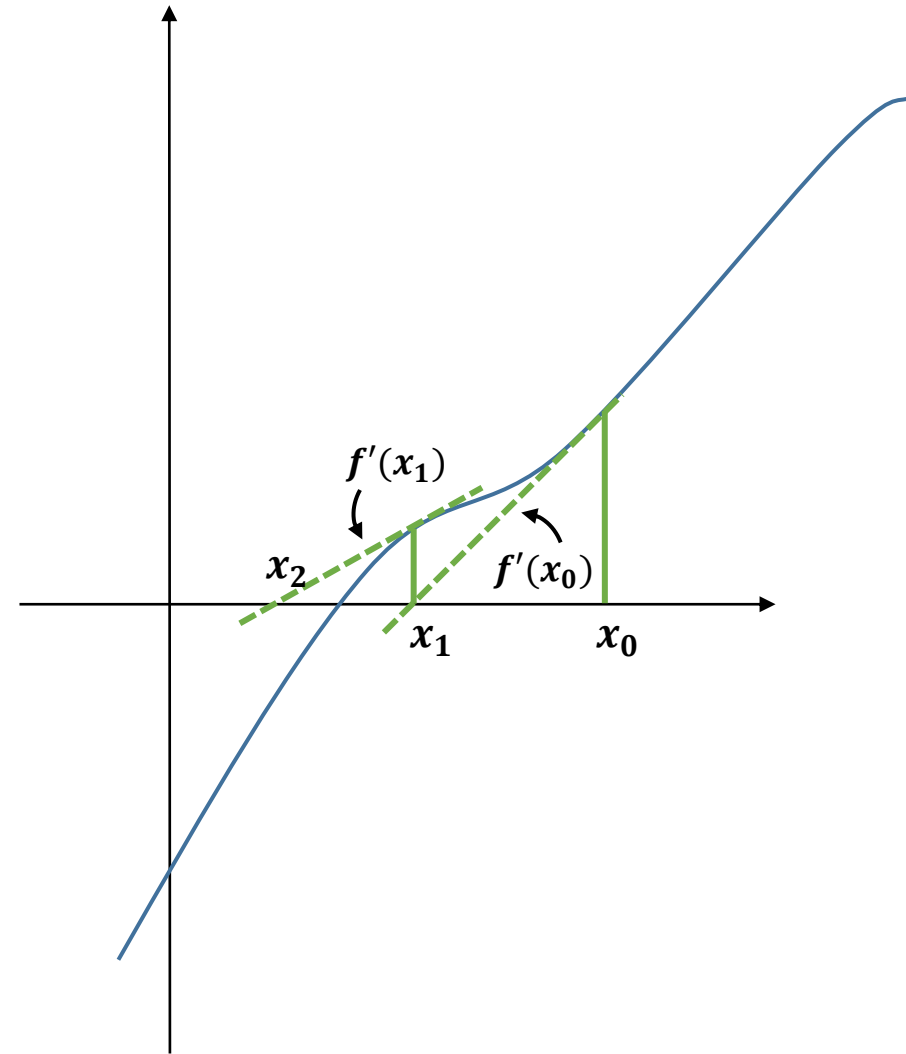


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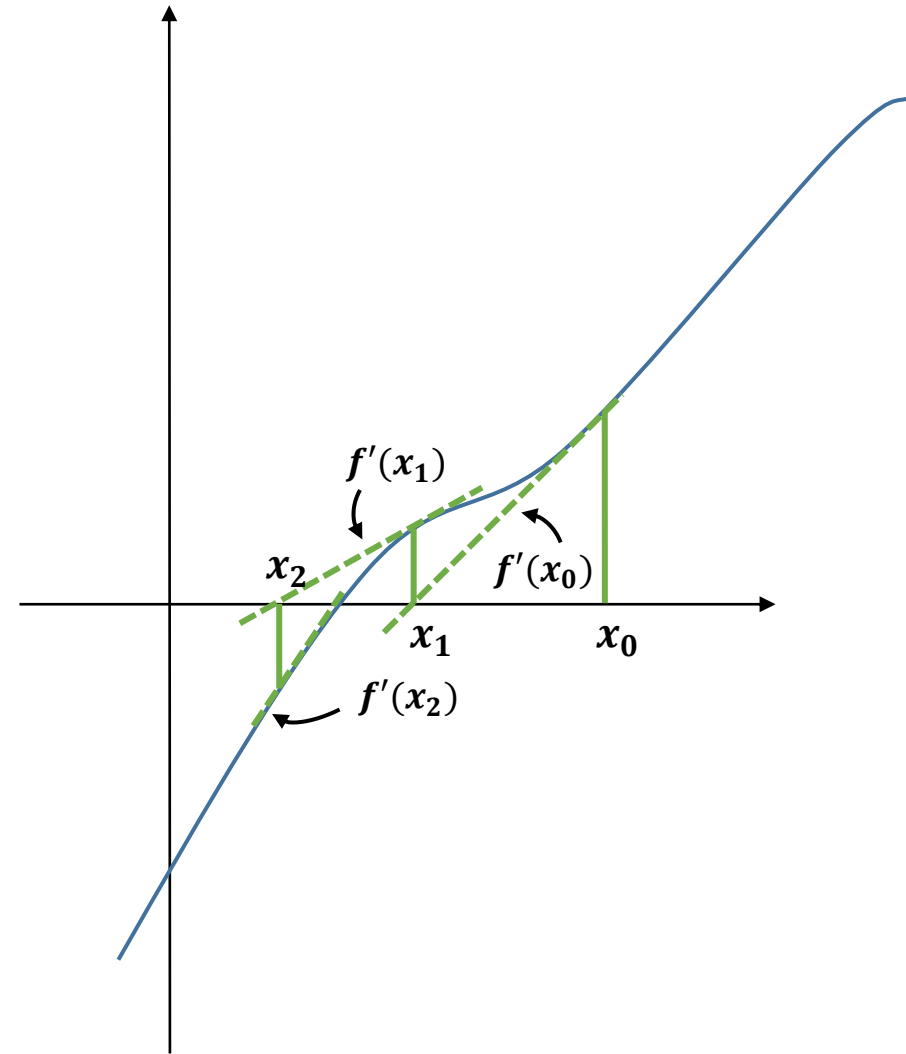


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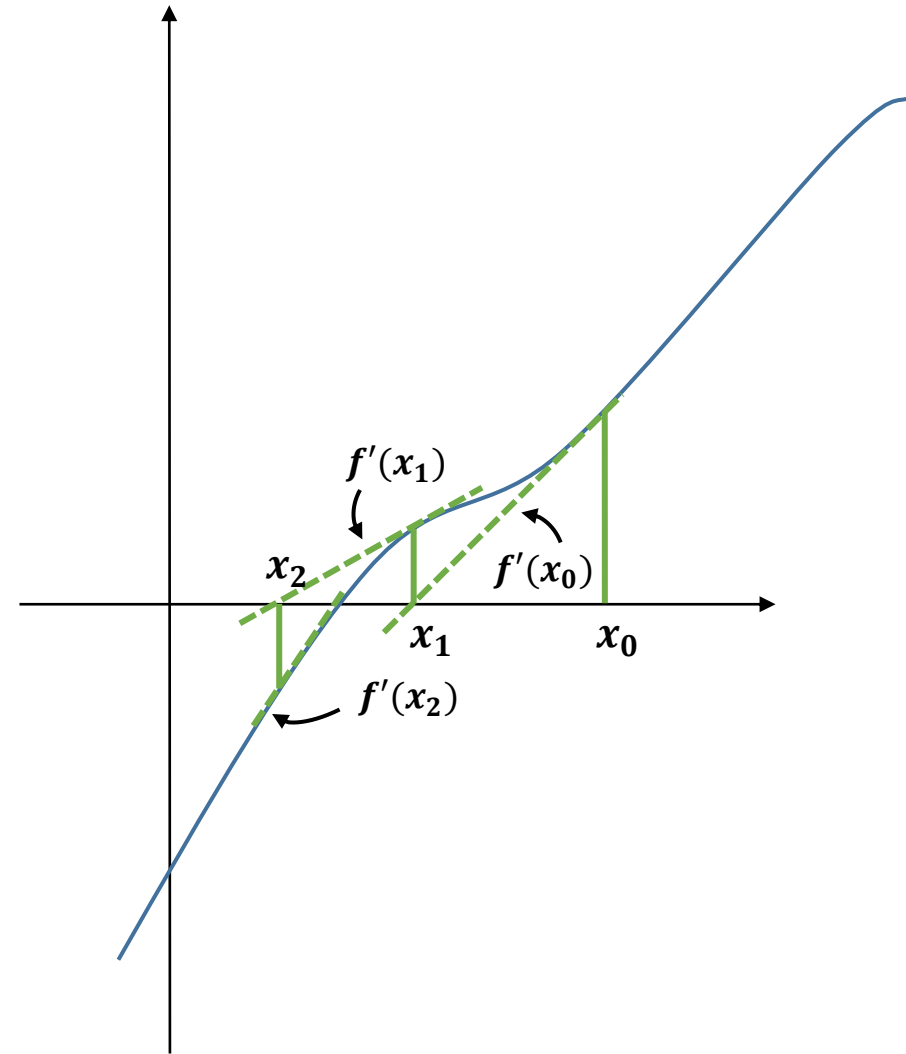


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# Newton-Raphson-Verfahren

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

# Newton-Raphson-Verfahren

$$f(x) = (x - 3)^2$$

$$f'(x) = 2(x - 3)$$

$x$

5

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

# Newton-Raphson-Verfahren

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

$$f(x) = (x - 3)^2$$

4

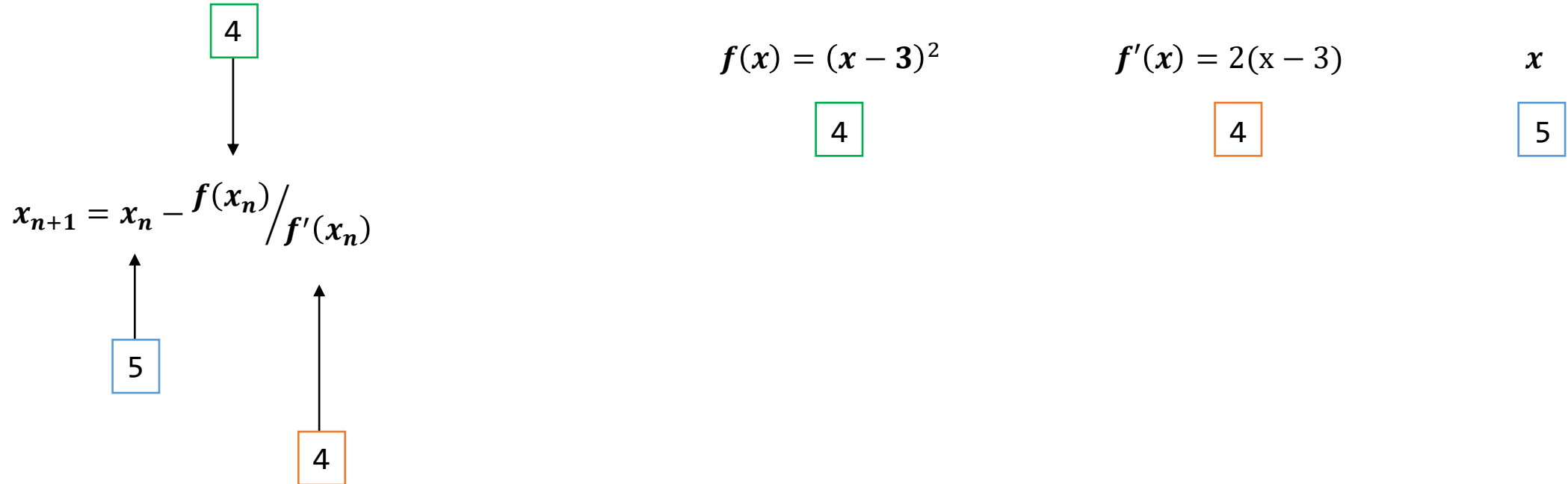
$$f'(x) = 2(x - 3)$$

4

$x$

5

# Newton-Raphson-Verfahren



# Newton-Raphson-Verfahren

$$x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)} = 4$$

The diagram illustrates the Newton-Raphson iteration formula  $x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)}$ . Arrows indicate the flow of values: a green box with '4' points down to the denominator  $f'(x_n)$ ; a blue box with '5' points up to  $x_n$ ; an orange box with '4' points up to the numerator  $f(x_n)$ . The result '4' is shown in a red box.

$$f(x) = (x - 3)^2$$

$$4$$

$$f'(x) = 2(x - 3)$$

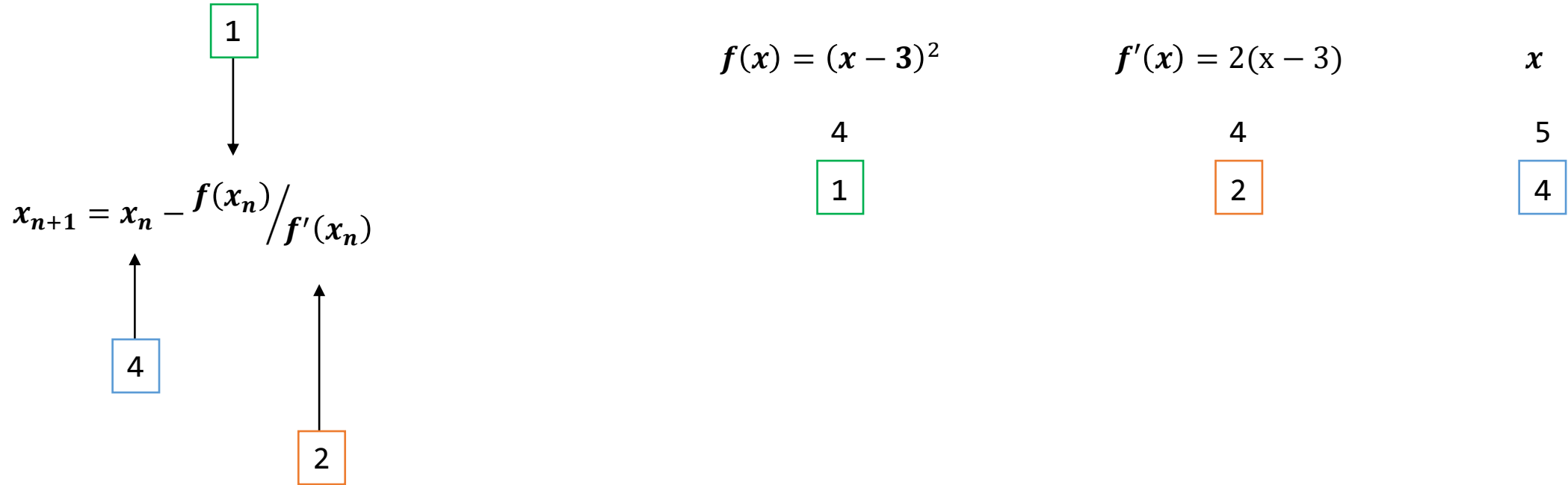
$$4$$

$x$

$$5$$

$$4$$

# Newton-Raphson-Verfahren



# Newton-Raphson-Verfahren

$$x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)} = 3.5$$

Diagram illustrating the Newton-Raphson iteration formula. A green box with the number 1 points down to the formula. A blue box with the number 4 points up to  $x_n$ . An orange box with the number 2 points up to  $f'(x_n)$ . The result 3.5 is highlighted in a red box.

$$f(x) = (x - 3)^2$$

4

1

$$f'(x) = 2(x - 3)$$

4

2

$x$

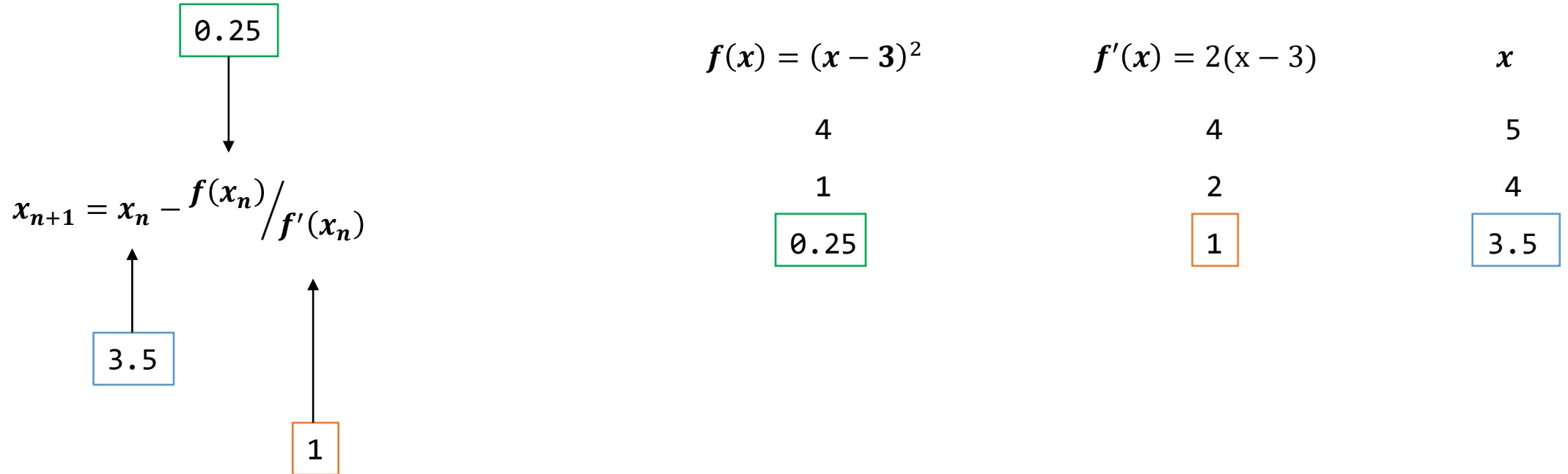
5

4

3.5



# Newton-Raphson-Verfahren



# Newton-Raphson-Verfahren

$$x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)} = 3.25$$

Diagram illustrating the Newton-Raphson iteration formula. The value 0.25 (in a green box) is shown above the formula, with an arrow pointing down to the denominator  $f'(x_n)$ . The value 3.5 (in a blue box) is shown below the formula, with an arrow pointing up to  $x_n$ . The value 1 (in an orange box) is shown below the formula, with an arrow pointing up to the denominator  $f'(x_n)$ . The result 3.25 is shown in a red box next to the equals sign.

$$f(x) = (x - 3)^2$$

4

1

0.25

$$f'(x) = 2(x - 3)$$

4

2

1

$x$

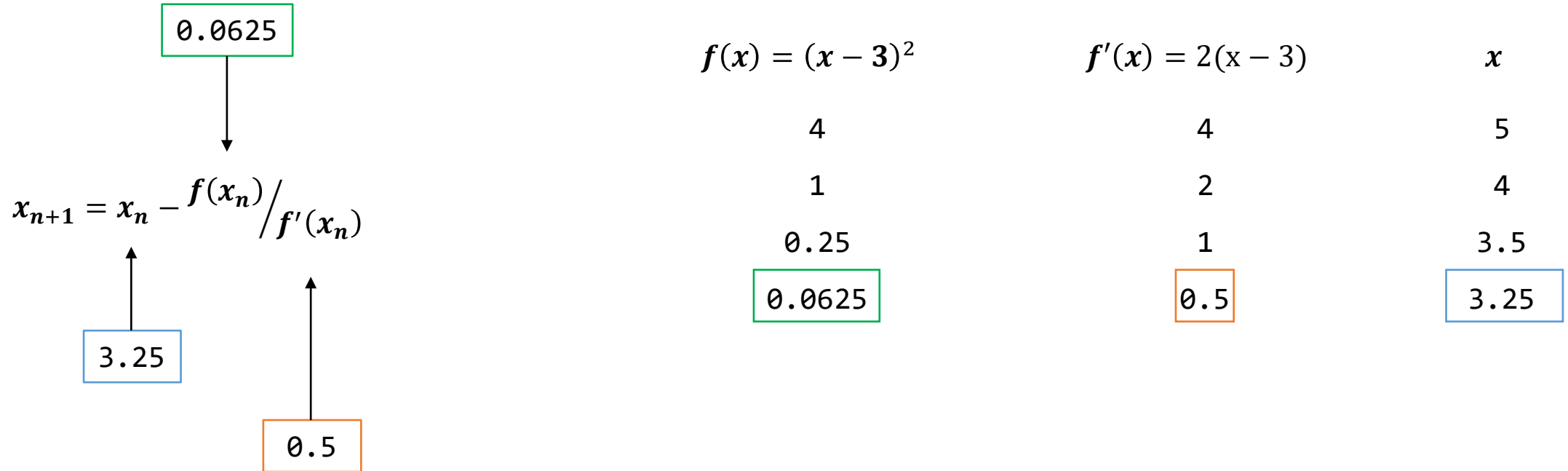
5

4

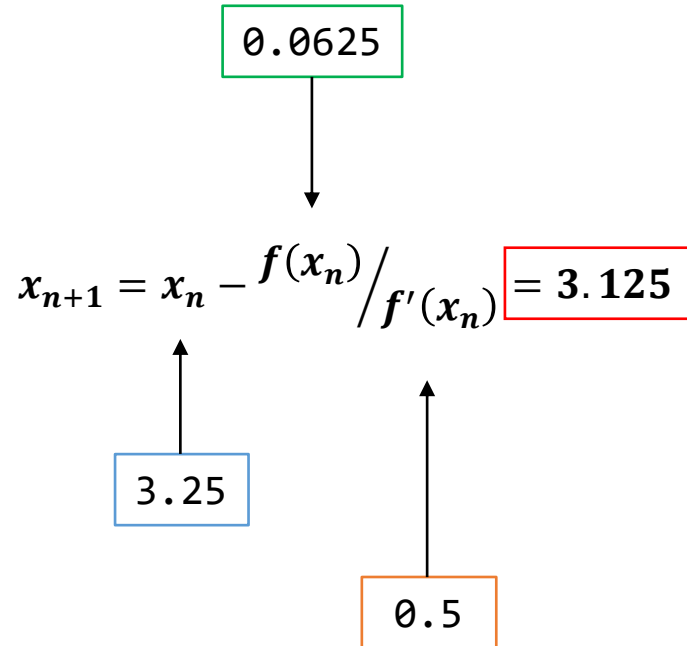
3.5

3.25

# Newton-Raphson-Verfahren



# Newton-Raphson-Verfahren



$$f(x) = (x - 3)^2$$

4

1

0.25

0.0625

$$f'(x) = 2(x - 3)$$

4

2

1

0.5

$x$

5

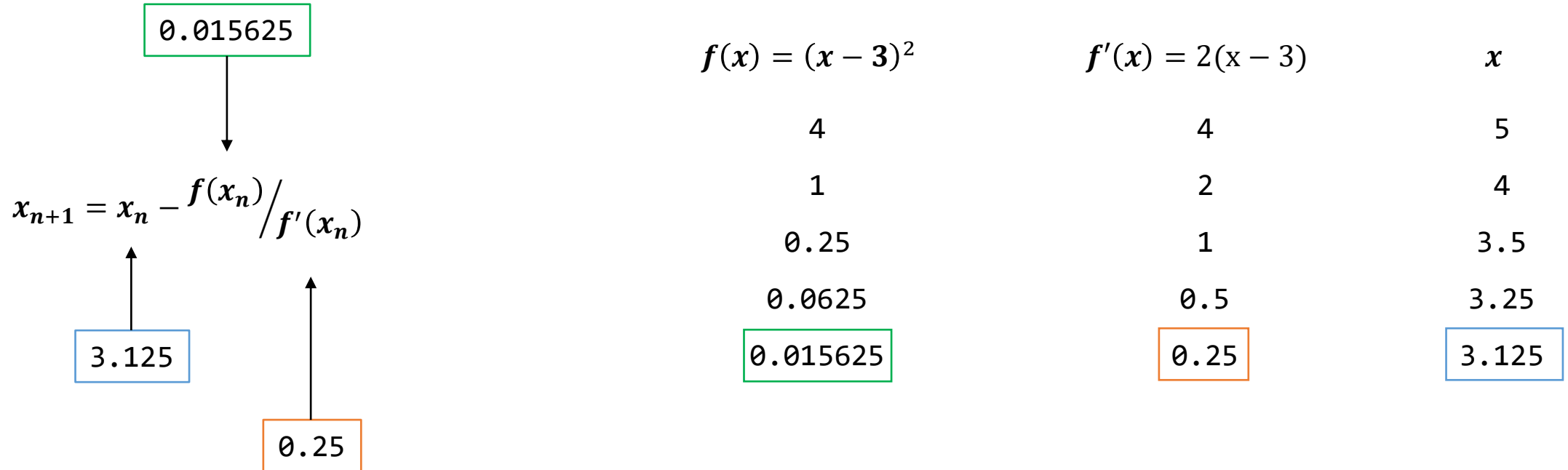
4

3.5

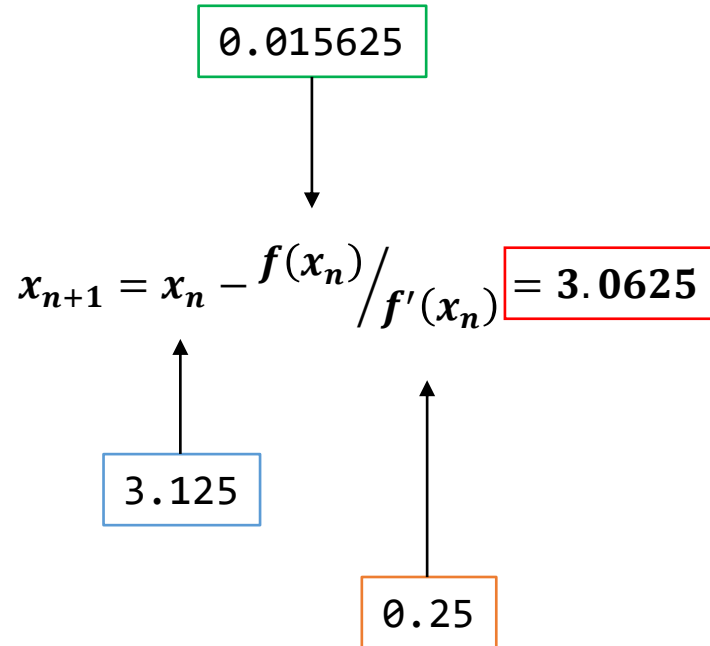
3.25

3.125

# Newton-Raphson-Verfahren



# Newton-Raphson-Verfahren



$$f(x) = (x - 3)^2$$

4

1

0.25

0.0625

0.015625

$$f'(x) = 2(x - 3)$$

4

2

1

0.5

0.25

$x$

5

4

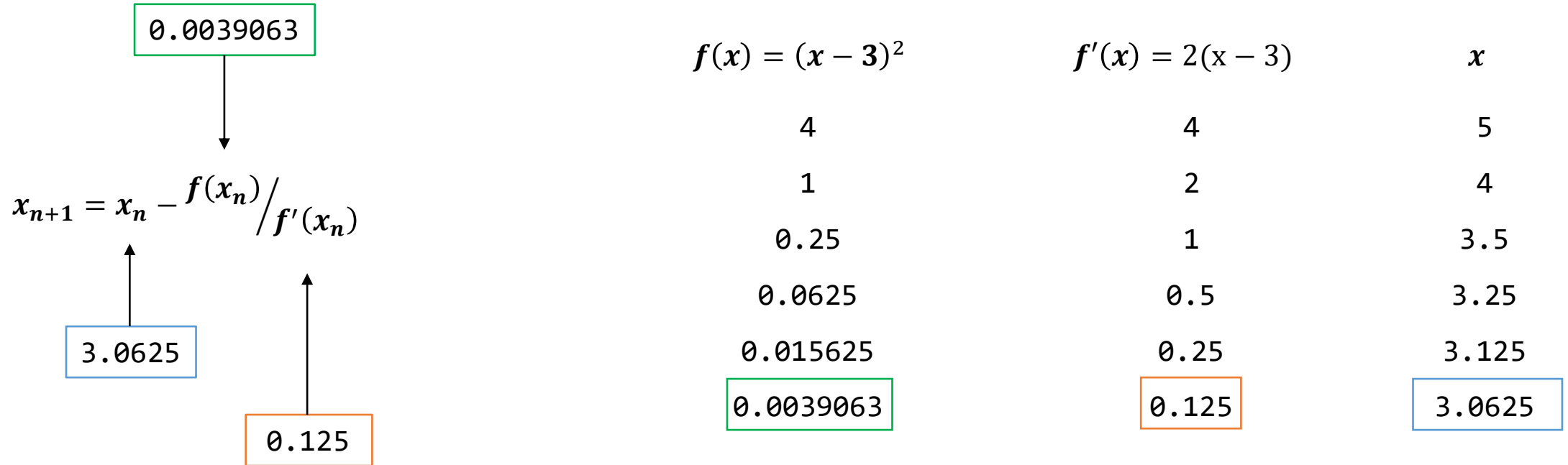
3.5

3.25

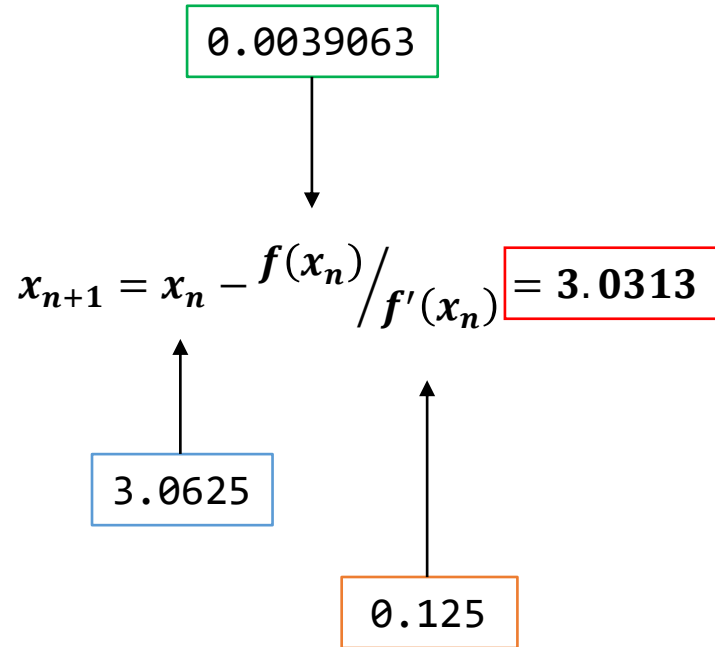
3.125

3.0625

# Newton-Raphson-Verfahren



# Newton-Raphson-Verfahren



$$f(x) = (x - 3)^2$$

4

1

0.25

0.0625

0.015625

0.0039063

$$f'(x) = 2(x - 3)$$

4

2

1

0.5

0.25

0.125

$x$

5

4

3.5

3.25

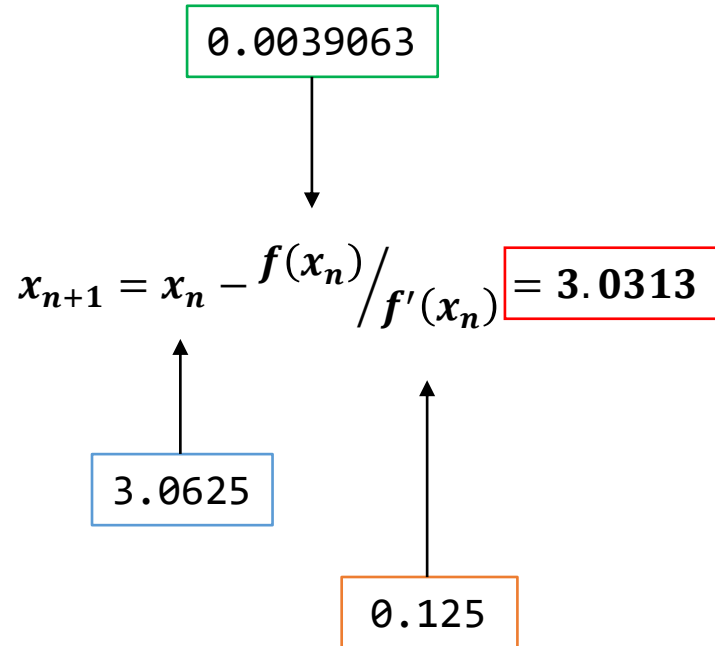
3.125

3.0625

3.0313



# Newton-Raphson-Verfahren



$$f(x) = (x - 3)^2$$

4  
1  
0.25  
0.0625  
0.015625  
**0.0039063**

**0.0**

$$f'(x) = 2(x - 3)$$

4  
2  
1  
0.5  
0.25  
**0.125**

$x$

5  
4  
3.5  
3.25  
3.125  
**3.0625**  
**3.0313**

**3.0**