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Metode Numerik

$f(u) = 25u^3 - 6u^2 + 7u - 88$

$\Rightarrow f(3) = 25.3^3 - 6.3^2 + 7.3 - 88$
$= 25.27 - 6.9 + 21 - 88$
$= 675 - 54 + 21 - 88$
$= 554$

$f'(u) = 3.25u^2 - 2.6u + 7$
$= 75u^2 - 12u + 7$

$f''(u) = 2.75u - 12$
$= 150u - 12$

$f'''(u) = 150$

• Zero-order approximation:
$f(3) \simeq f(1) = 25.1^3 - 6.1^2 + 7.1 - 88$
$= 25 - 6 + 7 - 88$
$= -62$

True percent relative error:
$\varepsilon t = \dfrac{554 - (-62)}{554}$
$= 1,112$
$= 111,2\%$

• first-order approximation:
$f(3) \simeq f(1) + f'(1)h = -62 + (75.1^2 - 12.1 + 7)(3-1)$
$= -62 + (75 - 12 + 7)(2)$
$= 78$

True Percent relative error:
$\varepsilon t = \dfrac{554 - 78}{554} = 0,8592 = 85,92\%$

• two-order approximation:
$f(3) \simeq f(1) + f'(1)h + \dfrac{f''(1)}{2!}h^2 = 78 + \dfrac{(150.1 - 12)}{2} 2^2$
$= 78 + 276$
$= 354$

True percent relative error:
$\varepsilon t = \dfrac{554 - 354}{554} = 0,3610 = 36,1\%$

• Third-order approximation:
$f(3) \simeq f(1) + f'(1)h + \dfrac{f''(1)h^2}{2!} + \dfrac{f'''(1)h^3}{3!} = 354 + \dfrac{150}{6}2^3 = 554$

True percent relative error:
$\varepsilon t = \dfrac{554 - 554}{554} = 0$

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