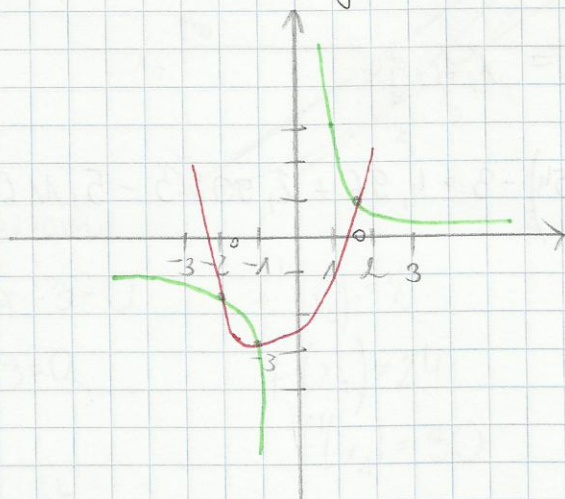


## Ćwiczenia 3

Wyznaczyć równanie przebiegającej wartości pierw. równania  $x^3 + x^2 - 3x - 3 = 0$



$$\begin{aligned} x^2(x+1) - 3(x+1) &= 0 \\ (x^2 - 3)(x+1) &= 0 \\ (x - \sqrt{3})(x + \sqrt{3})(x+1) &= 0 \\ x = \sqrt{3} \quad x = -\sqrt{3} \quad x = -1 \end{aligned}$$

$$f(x) = 0$$

$$g(x) = h(x) \text{ miejsca przecięcia } -1$$

$$\underline{x^2 + x - 3 = \frac{3}{x}}$$

Próbujemy przybliżyć  $\sqrt{3}$

metoda bisekcji

$$a_0 = 1$$

$$a_1 = x_0 = 1,5$$

$$b_0 = 2$$

$$b_1 = b_0 = 2$$

$$f(a_0) = -4$$

$$x_1 = \frac{1,5 + 2}{2} = 1,75$$

$$f(b_0) = 3$$

$$f(x_1) = (1,75)^3 + (1,75)^2 - 3(1,75) - 3 = 0,1719$$

$$x_0 = \frac{1+2}{2} = 1,5$$

$$f(x_0) = -1,875$$

$$a_2 = a_1 = 1,5$$

$$b_2 = x_1 = 1,75$$

$$x_2 = 1,625$$

$$\begin{aligned} f(x_2) &= (1,625)^3 + (1,625)^2 - 3(1,625) - 3 = 4,2910 + \\ &+ 2,6406 - 4,875 - 3 = \end{aligned}$$

metoda regula falsi

$$a_0 = 1$$

$$x_0 = 2 - \frac{2-1}{3+4} \cdot 3 = \frac{11}{7} = 1,5714$$

$$b_0 = 2$$

$$f(a_0) = -4$$

$$\begin{aligned} f(x_0) &= (1,5714)^3 + (1,5714)^2 - 3(1,5714) - 3 = \\ &= 3,8803 + 2,4693 - 4,7142 - 3 = -1,4646 \end{aligned}$$

$$f(b_0) = 3$$



$$a_1 = x_0 = 1,5714$$

$$b_1 = b_0 = 2$$

$$x_1 = 2 - \frac{2 - 1,5714}{3 + 1,4646} \cdot 3 = 2 - \frac{1,2858}{4,3646} \Rightarrow 1,7054$$

$$f(x_1) = (1,7054)^3 + (1,7054)^2 - 3(1,7054) - 3 = 4,96 + 2,9083 - 5,1162 - 3 = -0,2448$$

$$a_2 = x_1 = 1,7054 \quad f(x_1) \cdot f(b_1) < 0$$

$$b_2 = b_1 = 2$$

$$x_2 = 2 - \frac{2 - 1,7054}{3 + 0,2448} \cdot 3 = 1,7279$$

metoda rektangul

$$x_{m+1} = x_m - \frac{x_m - x_{m-1}}{f(x_m) - f(x_{m-1})} \cdot f(x_m)$$

$$x_m = b_m - \frac{b - a}{f(b) - f(a)} \cdot f(b)$$

$$x_0 = a = 1 \quad f(x_0) = -4$$

$$x_1 = b = 2 \quad f(x_1) = 3$$

$$x_2 = 2 - \frac{2 - 1}{3 + 4} \cdot 3 = 1,5714$$

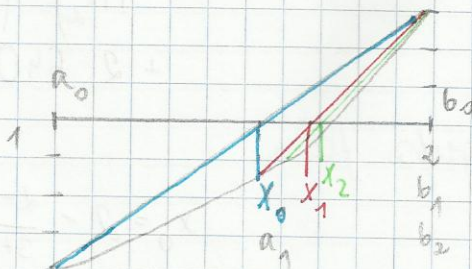
$$f(x_2) = -1,3646$$

$$x_3 = 1,7054$$

$$f(x_3) = -0,2448$$

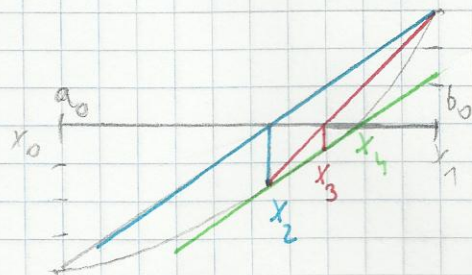
$$\cancel{f(x_1)} \quad x_4 = 1,7054 - \frac{1,7054 - 1,5714}{(-0,2448) - (-1,3646)} \cdot \cancel{1,7054} \cdot (-0,2448) = 1,7351$$

Reg falsi





metoda newton



metoda Newton

$$f(x) = x^3 + x^2 - 3x - 3 = 0$$

$$f'(x) = 3x^2 + 2x - 3 = 0$$

$$x_0 = 1$$

$$x_1 = 1 - \frac{-4}{2} = 1 + 2 = 3$$

$$x_2 = 3 - \frac{24}{30} = 3 - \frac{4}{5} = 2\frac{1}{5} = 2,2$$

$$x_3 = 2,2 - \frac{5,888}{15,92} = 1,8302$$

$$f'(x_0) = 2$$

$$f(x_1) = 24$$

$$f'(x_1) = 30$$

$$f(x_2) = 5,888$$

$$f'(x_2) = 15,92$$

$$x_{m+1} = x_m - \frac{f(x_m)}{f'(x_m)}$$