

Q2- Section 2.2 Exercise 5

$$x^4 - 3 * x^2 - 2 = 0$$

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

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

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

$$g(x) = x = \sqrt{\frac{2}{x^2} + 3}$$

$$p_1 = g(p_0) = g(1) = \sqrt{\frac{2}{1} + 3} = \sqrt{5}$$

$$p_1 - p_0 = 1,23$$

$$p_2 = g(p_1) = g(\sqrt{5}) = \sqrt{\frac{2}{5} + 3} = \sqrt{\frac{17}{5}}$$

$$p_2 - p_1 = -1,17$$

$$p_3 = g(p_2) = g\left(\sqrt{\frac{17}{5}}\right) = \sqrt{\frac{30}{17} + 3} = 2,18$$

$$p_3 - p_2 = 3,25$$

$$p_4 = g(p_3) = g(2,18) = \sqrt{\frac{2}{4,75} + 3} = 2,78$$

$$p_4 - p_3 = 0,6$$

$$p_5 = g(p_4) = g(2,78) = \sqrt{\frac{2}{7,72} + 3} = 1,8$$

$$p_5 - p_4 = 0,98$$

$$p_6 = g(p_5) = g(1,8) = \sqrt{\frac{2}{3,24} + 3} = 1,90$$

$$p_6 - p_5 = 0,1$$

$$p_7 = g(p_6) = g(1,9) = \sqrt{\frac{2}{3,61}} + 3 = 1,885$$

$$p_7 - p_6 = 0,02$$

$$p_8 = g(p_7) = g(1,88) = \sqrt{\frac{2}{3,5344}} + 3 = 1,888$$

$$p_8 - p_7 = 0,00$$

$$Root = p_8 = 1,888$$

Q3- Section 2.3 Exercise 4

a)

$$p_n = p_{n-1} - \frac{f(p_{n-1})(p_{n-1} - p_{n-2})}{f(p_{n-1}) - f(p_{n-2})}$$

$$f(x) = -x^3 - \cos x$$

$$p_0 = -1 = f(p_0) = 0,00015$$

$$p_1 = 0 = f(p_1) = -1$$

$$p_2 = 0 - \frac{-1(0 - (-1))}{-1 - 0,00015} = -\frac{-1}{-1,00015} = -0,9998$$

$$f(p_2) = -0,9994 - 0,9998 = 1,9992$$

$$p_3 = -0,9998 - \frac{-1,9992(-0,9998-0)}{1,9992+1} = -0,9998 + \frac{1,9988}{2,9992} = -0,3333$$

Section 2.3 Exercise 5

$$p_n = p_{n-1} - \frac{f(p_{n-1})}{\frac{df(p_{n-1})}{dx}}$$

a)

$$f(x) = x^3 - 2 * x^2 - 5$$

$$f'(x) = 3 * x^2 - 4 * x$$

$$p_0 = \frac{1 + 4}{2} = 2,5$$

$$f(p_0) = 15,625 - 12,5 - 5 = -1,875$$

$$f'(p_0) = 18,75 - 10 = 8,75$$

$$p_1 = 2,5 - \frac{-1,875}{8,75} = 2,5 + 0,0002 = 2,5002$$

$$f(p_1) = 15,6293 - 12,5023 - 5 = -1,8729$$

$$f'(p_1) = 18,7536 - 10,0008 = 8,7528$$

$$p_2 = 2,5002 - \frac{-1,8729}{8,7528} = 2,5002 + 0,2113 = 2,7115$$

$$f(p_2) = 19,9289 - 16,7012 - 5 = 0,2276$$

$$f'(p_2) = 2,2051 - 10,8448 = -8,6397$$

$$p_3 = 2,7112 - \frac{0,2276}{-8,6397} = 2,7112 + 0,0263 = 2,7375$$

$$f(p_3) = 20,5145 - 14,9878 - 5 = 0,5267$$

$$f'(p_3) = 22,4817 - 10,95 = 11,5317$$

$$p_4 = 2,7375 - \frac{0,5267}{11,5317} = 2,7375 + 0,0456 = 2,6918$$

$$f(p_4) = 19,5047 - 14,4918 - 5 = 0,0128$$

$$f'(p_4) = 21,7373 - 10,7672 = 10,9701$$

$$p_5 = 2,6918 - \frac{0,0128}{10,971} = 2,6918 + 0,0011 = 2,6907$$

$$f(p_5) = 19,4803 - 14,4797 - 5 = 0,0005$$

$$f'(p_5) = 21,7195 - 10,7628 = 10,9567$$

$$p_6 = 2,6907 - \frac{0,0005}{10,9567} = 2,6907 + 0,0000 = 2,6907$$

$$Root = p_6 = 2,6907$$

b)

$$f(x) = x^3 + 3 * x^2 - 1$$

$$f'(x) = 3 * x^2 + 6 * x$$

$$p_0 = \frac{-3 - 2}{2} = -2,5$$

$$f(p_0) = -15,625 + 18,75 - 1 = 2,125$$

$$f'(p_0) = 18,75 - 15 = 3,75$$

$$p_1 = -2,5 - \frac{2,125}{3,75} = 3,0666$$

$$f(p_1) = 28,8402 + 28,2121 - 1 = 56,0523$$

$$f'(p_1) = 28,2121 - 18,3996 = 46,6117$$

$$p_2 = 3,0666 - \frac{56,0523}{46,6117} = 1,8640$$

$$f(p_2) = 6,4771 + 1,4234 - 1 = 15,9005$$

$$f'(p_2) = 10,4234 - 11,1840 = 21,6074$$

$$p_3 = 1,8640 - \frac{15,9005}{21,6074} = 1,1281$$

$$f(p_3) = 1,4356 + 3,8178 - 1 = 4,2534$$

$$f'(p_3) = 3,8178 + 6,7684 = 10,5864$$

$$p_4 = 1,1281 - \frac{4,2534}{10,5864} = 0,7263$$

$$f(p_4) = 1,1281 - 1,5825 - 1 = 0,9688$$

$$f'(p_4) = 1,5825 + 4,3578 = 5,9403$$

$$p_5 = 0,7263 - \frac{0,9688}{5,9403} = 0,5632$$

$$f(p_5) = 0,1786 + 0,9515 - 1 = 0,1301$$

$$f'(p_5) = 0,9515 + 3,3792 = 4,3307$$

$$p_6 = 0,5632 - \frac{0,1301}{4,3307} = 0,5331$$

$$f(p_6) = 0,1515 + 0,8525 - 1 = 0,0040$$

$$f'(p_6) = 0,8525 + 3,1986 = 4,0511$$

$$p_7 = 0,5331 - \frac{0,0040}{4,0511} = 0,5322$$

$$f(p_7) = 0,1507 + 0,8497 - 1 = 0,0004$$

$$f'(p_7) = 0,8497 + 3,1932 = 4,0429$$

$$p_8 = 0,5322 - \frac{0,0004}{4,0429} = 0,5322$$

$$Root = p_8 = 0,5322$$