Q1

a. $p = \pi$, $p^* = 22/7$

Absolute error $= V_t - V_A$

$V_t = \pi$, $V_A = 22/7$

$= \pi - 22/7$

$= -0.0012$

Relative error $= \dfrac{V_t - V_a}{V_t}$

$= \dfrac{\pi - 22/7}{\pi}$

$= \dfrac{-0.0012}{\pi} = -0.000402$

b) $p = \pi$, $p^* = 3.1416$

Absolute error $= V_t - V_A$

$= \pi - 3.1416$

$= -0.00000073$

Relative error $= \dfrac{V_t - V_a}{V_t}$

$= \dfrac{\pi - 3.1416}{\pi}$

$= \dfrac{-0.00000073}{\pi}$

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e- $p = e^{10}$, $p^* = 22000$

Absolute error $= V_t - V_A$

$= e^{10} - 22000$

$= 26.465$

Relative error $= \dfrac{V_t - V_A}{V_t}$

$= \dfrac{e^{10} - 22000}{e^{10}}$

$= \dfrac{26.465}{e^{10}}$

$= 0.0012015$

n- $p = 9!$, $p^* = \sqrt{18\pi}\,(9/e)^9$

Absolute error $= V_t - V_A$

$= 9! - \sqrt{18\pi}\,(9/e)^9$

$= 362880 - 7.519884 \times 47811.48$

$= 362880 - 359536.8335$

$= 3343.16655$

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Q4

a) $\frac{4}{5} + \frac{1}{3}$

$\frac{12+5}{15}$

$\frac{17}{15}$

(i) 1.133333333

(ii) 1.133

(iii) 1.133

(iv) $\frac{V_t - V_A}{V_t}$

$\frac{1.133 - 1.133}{1.133}$

0

(b) $\frac{4}{5} \cdot \frac{1}{3} \Rightarrow \frac{4}{15}$

(i) 0.2666666667

(ii) 0.266

(iii) 0.267

(iv) $V_t - V_A$

$0.266 - 0.267$

$= -0.003$

Q5

a- $133 + 0.921$

133.921

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Q1 $f(x) = \sqrt{x} - \cos x$

on $[0, 1]$

$a = 0, \quad b = 1$

1st iteration:

$f(a) = \sqrt{0} - \cos(0)$

$= -1$

$f(b) = \sqrt{1} - \cos(1)$

$= 1 - 0.54030$

$= 0.459697$

$x = \frac{a+b}{2} = \frac{0+1}{2} = 0.5$

$f(0.5) = \sqrt{0.5} - \cos(0.5)$

$= 0.707106 - 0.87758$

$= -0.1704$

2nd iteration:

$a = \cancel{0}1, \quad b = \cancel{0}.5$

$f(a) = \sqrt{0} - \cancel{\cos(0)}$

$= \cancel{-1}\ 0.459697$

$f(b) = \sqrt{0.5} - \cos(0.5)$

$= 0.707106 - 0.87758$

$= -0.1704$

$x = \frac{\cancel{0}+\cancel{0}.5}{} = \frac{\cancel{0}.5}{2} = \cancel{0}.25$

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

$a = 0, \quad b = 1$

$f(a) = 2(0) + 3\cos(0) - e^0$

$f(a) = 0 + 3 - 1$

$f(a) = 2$

$f(b) = 2(1) + 3\cos(1) - e^1 =$

$= 2 + 3(0.540302) - 2.718282$

$= 2 + 1.620906 - 2.718282$

$= 0.902624$

$x = \frac{0+1}{2} = \frac{1}{2} = 0.5$

$f(0.5) = 2(0.5) + 3\cos(0.5) - e^{0.5}$

$= 1 + 2.63748 - 1.64872$

$= 1.988759$

Scanned with CamScanner

(3) $x^3 - x - 1 = 0$

$x^3 = x + 1$

$\phi(x) = x = \frac{x+1}{x^2} \Rightarrow \frac{1}{x} + \frac{1}{x^2}$

$\phi'(x) = -x^{-2} - 2x^{-3}$

$\phi'(x) = -\frac{1}{x^2} - \frac{2}{x^3} \Rightarrow -\frac{1}{(1)^2} - \frac{2}{(1)^3}$

$= -1 - 2 = |-3| \Rightarrow 3$

(4) $x^3 - x - 1 = 0$

$x^3 = x + 1$

$x^2 = \frac{x+1}{x}$

$\phi(x) = x = \sqrt{\frac{x+1}{x}} \Rightarrow \left(\frac{x+1}{x}\right)^{1/2} \Rightarrow \left(1 + \frac{1}{x}\right)^{1/}$

$\phi'(x) = \frac{1}{2}\left(1 + \frac{1}{x}\right)^{-1/2}(-x^{-2})$

$P_0 = 1$

$= \frac{1}{2}(1+1)^{-1/2}(-1^{-2})$

$= -\frac{1}{2}(2)^{-1/2} \Rightarrow -\frac{1}{2\sqrt{2}}$

$= |-0.353553|$

$= 0.3$

Scanned with CamScanner

Q6

$f(x) = x^3 - x - 1 = 0 \quad [1, 2] \quad P_0 = 1$

$f(1) = 1^3 - 1 - 1$

$= 1 - 2 \Rightarrow -1$

$f(2) = 2^3 - 2 - 1 \Rightarrow 8 - 3 \Rightarrow 5$

(1) $f \; x^3 - x - 1 = 0$

$x^3 - 1 = x = \phi(x)$

$P_0 = 1 \qquad \phi'(x) = 3x^2$

$x = 1^3 - 1 \qquad \phi'(x) = 3(1)^2$

$x = 1 \qquad = 3$

$\frac{1}{3} - 1$

$\frac{1-3}{3} = -2/3$

(2) $x^3 - x - 1 = 0$

$x^3 = x + 1$

$(x^3)^{1/3} = (x+1)^{1/3}$

$\phi(x) = x = (x+1)^{1/3}$

$\phi'(x) = \frac{1}{3}(x+1)^{-2/3}(1)$

$P_0 = 1$

$\phi'(x) = \frac{1}{3}(1+1)^{-2/3}$

$= \frac{1}{3}(2)^{-2/3} \Rightarrow \frac{1}{3(2)^{2/3}}$

$\phi'(x) = 0.209987$

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$$\phi'(x) = \frac{x \frac{d}{dx}(3x^2+3)^{1/2} - (3x^2+3)^{1/2}\frac{d}{dx}x}{x^2}$$

$$= \frac{x \frac{1}{2}(3x^2+3)^{-1/2} 6x - \sqrt{(3x^2+3)}}{x^2}$$

$$= \frac{x/2\,(3x^2+3)^{-1/2} - \sqrt{3x^2+3}}{x^2}$$

$$x_0 = 1$$

$$= \frac{6x/2\,(3(1)^2+3)^{-1/2} - \sqrt{3(1)^2+3}}{(1)^2}$$

$$= \frac{6(1)}{2\sqrt{6}} - \sqrt{6}$$

$$= \cancel{0.166667} - 3$$

$$\cancel{= 2.8}$$

$$= 0.204124 - 2.449$$

$$= -2.245366$$

(6)

$$x^4 = 3x^2 + 3$$

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

$$\phi'(x) = \frac{x^3 \frac{d}{dx}(3x^2+3) - (3x^2+3)\frac{d}{dx}x^3}{(x^3)^2}$$

$$= \frac{x^3(6x) - (3x^2+3)(3x^2)}{x^6}$$

Scanned with CamScanner

Q6

$f(x) = x^4 - 3x^2 - 3 = 0$

$f(1) = 1^4 - 3(1) - 3$

$f(1) = 1 - 3 - 3$

$f(1) = 1 - 6 \Rightarrow -5$

$f(2) = 2^4 - 3(2)^2 - 3$

$= 16 - 3(4) - 3$

$= 16 - 12 - 3$

$= 16 - 15$

$f(2) = 1$

Scanned with CamScanner

① $x^4 - 3x^2 - 3 = 0$

$$x^4 = 3x^2 + 3$$

$$x = (3x^2 + 3)^{1/4}$$

$$\cancel{x_0}$$

$$\phi(x) = x = (3x^2 + 3)^{1/4}$$

$$\phi'(x) = \frac{1}{4}(3x^2+3)^{-3/4}(6x)$$

$$x_0 = 1$$

$$\phi'(x) = \frac{1}{4}(3(1)^2+3)(6(1))$$

$$= \frac{1}{4}(3+3)(6)$$

$$= \frac{36}{4} = 9$$

② $x^2 = \dfrac{3 - x^4}{-3}$

$$\cancel{\phi}(x) = x = -\sqrt{\frac{3-x^4}{3}}$$

$$\phi'(x) = -\frac{1}{\cancel{2}}\left(\frac{3-x^4}{3}\right)^{-1/2}\frac{1}{3}(-\cancel{4}x^3)$$

$$\phi'(x) = \frac{1}{9}(3-x^4)^{-1/2}(x^3)$$

$$= \frac{1}{9}(3-1^4)^{-1/2}(1)^3$$

$$= \frac{1}{9}(2)^{-1/2}$$

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$$\frac{du}{dv} = \frac{v\frac{du}{dx} - u\frac{dv}{dx}}{v^2}$$

$$= \frac{1}{9}\left(\frac{1}{\sqrt{2}}\right)$$

$$= \cancel{0.078567} = 0.384900$$

(3) $$x = \frac{3 - x^4}{-3x}$$

$$\phi(x) = x = \frac{3 - x^4}{-3x}$$

$$\phi'(x) = \frac{-3x\frac{d}{dx}(3-x^4) - (3-x^4)\frac{d}{dx}(-3x}{}$$

$$= \frac{-3x(-4x^3) - (3-x^4)(-3)}{(-3x)^2}$$

$$= 12x^4 + 3(3 - x^4)/9x^2$$

$$= 12x^4 + 9 - 3x^4/9x^2$$

$$x_0 = 1$$

$$= 12(1)^4 + 9 - 3(1)^4/9(1)^2$$

$$= 12 + 9 - 3/9$$

$$= 12 + 6 = 18/9$$

$$= 2$$

Scanned with CamScanner

(4) $x^4 - 3x^2 - 3 = 0$

$$x^4 = 3x^2 + 3$$

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

$$\phi'(x) = \frac{x^3 \frac{d}{dx}(3x^2+3) - (3x^2+3)\frac{d}{dx}x}{(x^3)^2}$$

$$= \frac{x^3(6x) - (3x^2+3)(3x^2)}{x^6}$$

$$= \frac{6x^4 - 9x^4 - 9x^2}{x^6}$$

$$= \frac{-3x^4 - 9x^2}{x^6}$$

$$x_0 = 1$$

$$= \frac{-3(1)^4 - 9(1)^2}{(1)^6}$$

$$= \frac{-3-9}{1} = |-12| = 12$$

(5) $x^4 = 3x^2 + 3$

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

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

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

Scanned with CamScanner

Q3(a) 1st iteration:

$x - 2^{-x} = 0$

$a = 0, b = 1$

$f(a) = 0 - 2^{-0}$

$= -1$

$f(b) = 1 - 2^{-1}$

$= 1 - \frac{1}{2}$

$= 1/2 = 0.5$

$x = \frac{a+b}{2} = \frac{0+1}{2} = \frac{1}{2} = 0.5$

~~$f(0.5) = 0.5 \quad 0.5^{-}$~~

$f(0.5) = 0.5 - 2^{-0.5}$

$= 0.5 - 0.707$

$= -0.207107$

2nd iteration:

$a = 0.5, b = 1$

$f(a) = -0.207107$

$f(b) = 0.5$

$x = \frac{0.5+1}{2} = \frac{1.5}{2}$

$x = 0.75$

$f(0.75) = 0.75 - 2^{-0.75}$

$= 0.75 - 0.594604$

$= 0.155396$

3rd iteration

$a = 0.5, b = 0.75$

$f(a) = -0.207107$

$f(b) = 0.155396$

$x = \frac{a+b}{2} = \frac{0.5+0.75}{2}$

$x = \frac{1.25}{2}$

$x = 0.625$

$f(0.625) = 0.625 - 2^{-0.625}$

$= -0.023420$

4th iteration:

$a = 0.625, b = 0.75$

$f(a) = -0.02340$

$f(b) = 0.155396$

$x = \frac{a+b}{2} = \frac{0.625+0.75}{2}$

$x = \frac{1.375}{2}$

$x = 0.6875$

$= 0.010467$

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$f(0.6875) = 0.6875 - 2^{-0.6875}$

$= 0.6875 - 0.620929$

$= 0.066571$

5th iteration

$a = 0.6875, b = 0.625$

$f(a) = 0.066571$

$f(b) = -0.02340$

$$x = \frac{0.6875 + 0.625}{2}$$

$$x = \frac{1.3125}{2}$$

$x = 0.65625$

$f(0.65625) = 0.65625 - 2^{-0.65625}$

$= 0.65625 - 0.634525$

$= 0.021725$

6th iteration:

$a = 0.65625, b = 0.625$

$f(a) = 0.021725$

$f(b) = -0.02340$

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5th iteration.

$a = 0.5625$, $b = 0.625$

$f(0.5625) = -0.161$

$f(0.625) = 0.259765$

$$x = \frac{0.5625 + 0.625}{2} = \frac{1.1875}{2} = 0.59375$$

$$f(0.59375) = 0.59375^3 - 7(0.59375)^2 + 14(0.59375) - 6$$

$$= 0.0540$$

6th iteration:

$a = 0.59375$ $b = 0.5625$

$f(0.59375) = 0.0540$

$f(0.5625) = -0.160$

$$x = \frac{a+b}{2} = \frac{0.59375 + 0.5625}{2}$$

~~0.0540 − 0.160~~

$x = 0.578125$

$$f(0.578125) = 0.578125^3 - 7(0.578125)^2 + 14(0.578125) - 6$$

$= -0.002624$

Scanned with CamScanner

7th iteration

$a = 0.578125$, $b = 0.59375$

$f(0.578125) = -0.052624$

$f(0.59375) = 0.0540$

$$x = \frac{0.578125 + 0.59375}{2} = \frac{1.171875}{2}$$

$x = 0.585938$

$$f(0.585938) = 0.585938^3 - 7(0.585938)^2 + 14(0.585938) - 6$$

$= 0.001035$

$\boxed{\text{The root is } 0.585938}$

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$$x = \frac{0.65625 + 0.625}{2}$$

$$x = \frac{1.281250}{2}$$

$$x = 0.640625$$

$$f(0.640625) = 0.640625 - 2^{-0.640625}$$

$$= 0.640625 - 0.641435$$

$$= -0.000810$$

The iteration:

$a = 0.640625, b = 0.65625$

$f(a) = -0.000810$

$f(b) = 0.021725$

$$x = \frac{0.640625 + 0.65625}{2}$$

$$x = \frac{1.296875}{2}$$

$$x = 0.648438$$

$$f(0.648438) = 0.648438 - 2^{-0.648438}$$

$$= 0.648438 - \cancel{0.337400}\ 0.637971$$

$$= 0.010467$$

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8th iteration

$a = 0.648438$, $b = 0.640625$

$f(a) = 0.010467$

$f(b) = -0.000810$

$$x = \frac{0.648438 + 0.640625}{2}$$

$$x = \frac{1.289063}{2} = 0.644532$$

$$f(0.644532) = 0.644532 - 2^{-0.644532}$$

$$= 0.644532 - 0.639700$$

$$= 0.004832$$

9th iteration

$a = 0.644532$, $b = 0.640625$

$f(a) = 0.004832$

$f(b) = -0.000810$

$$x = \frac{0.644532 + 0.640625}{2}$$

$$x = \frac{1.285157}{2} = 0.642579$$

$$f(0.642579) = 0.642579 - 2^{-0.642579}$$

$$= 0.642579 - 0.640567$$

$$= 0.002012$$

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10th iteration :

$\cancel{f(a)} = a = 0.642579, b = 0.640625$

$$x = \frac{0.642579 + 0.640625}{2}$$

$$x = \frac{1.283204}{2} = 0.641602$$

$$f(0.641602) = 0.641602 - 2^{-0.641602}$$

$$= 0.641602 - 0.641001$$

$$= 0.000601$$

11th iteration:

$a = 0.641602, \quad b = 0.640625$

$f(a) = 0.000601$

$f(b) = -0.000810$

$$x = \frac{0.641602 + 0.640625}{2} = \frac{1.282227}{2}$$

$$x = 0.641114$$

$$f(0.641114) = 0.641114 - 2^{-0.641114}$$

$$= \cancel{0.6411} \; 0.641114 - 0.641218$$

$$= -0.000104$$

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12th iteration:

$a = 0.641114$

$b = 0.641602$

$f(a) = -0.000104$

$f(b) = 0.000601$

$$x = \frac{0.64114 + 0.641602}{2} =$$

$x = 0.641371$

$f(x) = 0.641371 - 2^{-0.641371}$

$= 0.641371 - 0.641103$

$= 0.000268$

13th iteration:

$a = 0.641371, \; b = 0.641114$

$f(a) = 0.000268$

$f(b) = 0.000601$

$$x = \frac{0.641371 + 0.641114}{2}$$

$x = 0.641243$

$f(x) = 0.641243 - 2^{-0.641243}$

$= 0.641243 - 0.641161$

$= 0.000082$

Scanned with CamScanner

Q12 1st iteration:

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

$a = 1, \quad b = 2$

$f(a) = 1^2 - 3$

$= 1 - 3 = -2$

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

$= 4 - 3 = 1$

$x = \frac{a+b}{2} = \frac{1+2}{2} = \frac{3}{2} = 1.5$

$f(1.5) = (1.5)^2 - 3$

$= 2.25 - 3 = -0.75$

2nd iteration:

$a = 1.5, \quad b = 2$

$f(a) = -0.75$

$f(b) = 1$

$x = \frac{a+b}{2} = \frac{1.5+2}{2} = \frac{3.5}{2} = 1.75$

$f(1.75) = (1.75)^2 - 3$

$= 3.0625 - 3$

$= 0.0625$

3rd iteration:

$a = 1.75, \quad b = 1.5$

$f(a) = 0.0625$

$f(b) = -0.75$

$x = \frac{a+b}{2} = \frac{1.75+1.5}{2} = \frac{3.25}{2} = 1.625$

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~~4th iteration~~:

$f(1.625) = (1.625)^2 - 3$

$= 2.640625 - 3$

$= -0.359$

4th iteration

$a = 1.625, \; b = 1.75$

$f(a) = -0.359$

$f(b) = 0.0625$

$x = \frac{1.625 + 1.75}{2} = \frac{3.375}{2} = \cancel{0.84375}$ 1.6875

$f(0.84375) = (\cancel{0.84375})^2 - 3$ 1.6875

$\cancel{= 0.711914 - 3}$

$= 2.847658 - 3$

$= -0.152344$

5th iteration:

$a = 1.6875; \; b = 1.75$

$f(a) = -0.152344$

$f(b) = 0.0625$

$x = \frac{1.6875 + 1.75}{2} = \frac{3.4375}{2}$

$x = 1.71875$

$f(1.71875) = (1.71875)^2 - 3$

$= 2.954102 - 3$

$= -0.045898$

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6th iteration:

$a = 1.71875, \; b = 1.75$

$f(a) = -0.045898$

$f(b) = 0.0625$

$$x = \frac{1.71875 + 1.75}{2} = 1.734375$$

$$f(1.734375) = (1.734375)^2 - 3$$
$$= 3.008057 - 3$$
$$= 0.008057$$

7th iteration:

$a = 1.734375, \; b = 1.71875$

$f(a) = 0.008057, \; b = -0.045898$

$$x = \frac{1.734375 + 1.71875}{2} = 1.726563$$

$$f(1.726563) = (1.726563)^2 - 3$$
$$= 2.981018 - 3$$
$$= -0.018982$$

8th iteration:

$a = 1.726563, \; b = \cancel{1.71875}\ 1.734375$

$f(a) = -0.018982$

$f(b) = 0.008057$

$$x = \frac{1.726563 + 1.734375}{2}$$

$x = 1.730469$

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$f(1.730469) = (1.730469)^2 - 3$

$= 2.994523 - 3$

$= -0.005477$

9th iteration:

$a = 1.730469, \quad b = \cancel{1.726563}\ 1.734375$

$f(a) = -0.005474$

$f(b) = \cancel{-0.018982}\ 0.008057$

$x = \dfrac{1.730469 + \cancel{1.726563}\ 1.734375}{2}$

$= \cancel{1.728516}\ 1.732422$

$\cancel{f(1.728516) = (1.728516)^2 - 3}$

$\cancel{= 2.987168 - 3}$

$f(1.732422) = (1.732422)^2 - 3$

$= 3.001286 - 3$

$= 0.001286$

10th Iteration:

$a = 1.732422, \quad b = 1.730469$

$f(a) = 0.001286$

$f(b) = \cancel{1.730469} = 0.005474$

.75) =

Scanned with CamScanner

2nd order.

$$f(x) = \frac{(x-x_1)(x-x_2)}{(x_0-x_1)(x_0-x_2)} f(x_0) + \frac{(x-x_0)(x-x_2)}{(x_1-x_0)(x_1-x_2)} f(x_1)$$

$$+ \frac{(x-x_0)(x-x_1)}{(x_2-x_0)(x_2-x_1)} f(x_2)$$

(10.932494)

$$= \frac{(x-1.25)(x-1.6)}{(1-1.25)(1-1.6)}(6.389056) + \frac{(x-1)(x-1.6)}{(1.25-1)(1.25-1.6)}$$

$$+ \frac{(x-1)(x-1.25)}{(1.6-1)(1.6-1.25)}(22.932530)$$

(10.932494)

$$= \frac{(x^2-1.6x-1.25x+2)}{(-0.25)(-0.6)}6.389059 + \frac{(x^2-1.6x-x+1.6)}{(0.25)(-0.35)}$$

$$+ \frac{(x^2-1.25x-x+1.25)}{(0.6)(0.35)}(22.932530)$$

(124.9427)

$$= (x^2-2.85x+2)(42.597267) + (x^2-2.6x+1.6)$$

$$+ (x^2-2.25x+1.25)(109.202524)$$

at $x = 1.4$ (124.9427)

$$= ((1.4)^2-2.85(1.4)+2)(42.597267) + ((1.4)^2-2.6(1.4)+1.6)$$

$$+ ((1.4)^2-2.25(1.4)+1.25)(109.202524)$$

$$= -1.277918 + 9.995416 + 44.7730$$

$$= \cancel{-33.499701}\ 15.269540$$

Q5

$x_0 = 8.4$

(a) $f(8.4) = 16.94410$

$x_1 = 8.3$ $f(8.3)$

(a) $f(\overset{x_0}{8.1}) = 16.94410$

$f(\overset{x_1}{8.3}) = 17.56492$

$f(\overset{x_2}{8.6}) = 18.50515$

$f(\overset{x_3}{8.7}) = 18.82091$

Ist order

$$f(x) = \frac{x - x_1}{x_0 - x_1} f(x_0) + \frac{(x - x_0)}{(x_1 - x_0)} f(x_1)$$

$$= \frac{(x - 8.3)}{(8.1 - 8.3)} (16.94410) + \frac{(x - 8.1)}{(8.3 - 8.1)} (17.5649$$

$$= (x - 8.3)(-84.7205) + (x - 8.1)(87.8246)$$

at $x = 8.4$

~~= 84.~~

$$= (8.4 - 8.3)(84.7205) + (8.4 - 8.1)(87.8246$$

$$= -8.472050 + 26.347380$$

~~= 34.8~~ $+ 17.875330$

2nd order.

$$= \frac{(x-x_1)(x-x_2)}{(x_0-x_1)(x_0-x_2)} f(x_0) + \frac{(x-x_0)(x-x_2)}{(x_1-x_0)(x_1-x_2)} f(x_1)$$

$$+ \frac{(x-x_0)(x-x_1)}{(x_2-x_0)(x_2-x_1)} f(x_2)$$

$$= \frac{(x-8.3)(x-8.6)}{(8.1-8.3)(8.1-8.6)} (16.94410) + ($$

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Q2 $f(x) = 3(x+1)(x-\frac{1}{2})(x-1)$

$a = -2, \; b = 1.5$

$f(a) = 3(-2+1)(-2-\frac{1}{2})(-2-1)$

$= 3(-1)(\frac{-4-1}{2})(-3)$

$= -3(\frac{-5}{2})(-3)$

$= -\frac{45}{2} = -22.5$

$f(b) = 3(1.5+1)(1.5-\frac{1}{2})(1.5-1)$

$= 3(2.5)(1)(0.5)$

$= 3.75$

$x = \frac{a+b}{2} = \frac{-2+1.5}{2}$

$x = \frac{-0.5}{2} = -0.25$

$f(-0.25) = 3(-0.25+1)(-0.25-\frac{1}{2})(-0.25-1)$

$= (2.25)(-0.75)(-1.25)$

$= 2.109375$

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2nd iteration.

$a = -2, \quad b = -0.25$

$f(a) = 3(-2+1)(-2-\frac{1}{2})(-2-1)$

$= 3(-1)(\frac{-4-1}{2})(-3)$

$= -3(-\frac{5}{2})(-3)$

$= -\frac{45}{2} \Rightarrow -22.5$

$f(b) = 3(-0.25+1)(-0.25-\frac{1}{2})(-0.25-1)$

$= (2.25)(-0.75)(-1.25)$

$= 2.109375$

$x = \frac{a+b}{2} = \frac{-2-0.25}{2} = \frac{-2.25}{2}$

$x = -1.125$

$f(-1.125) = 3(-1.125+1)(-1.125-\frac{1}{2})(-1.125-1)$

$= 3(-0.125)(-1.625)(-2.125)$

$= -1.2949$

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$f(0.25) = 0.5 - 0.96891$

$= -0.4689$

3rd iteration:

$a = 0.25, b = 0.5$

$f(0.25) = \sqrt{0.25} - \cos(0.25$

$= 0.5 - 0.96891$

$= -0.4689$

$f(0.5) = \sqrt{0.5} - \cos(0.5)$

$= 0.707106 - 0.877$

2nd iteration

$a = 1, b = 0.5$

$f(a) = \sqrt{1} - \cos(1)$

$= 1 - 0.54030$

$= 0.459697$

$f(b) = \sqrt{0.5} - \cos(0.5)$

$= 0.707106 - 0.87758$

$= -0.1704$

$x = \frac{1 + 0.5}{2} = \frac{1.5}{2} = 0.75$

$f(0.75) = \sqrt{0.75} - \cos(0.75)$

$= 0.8660 - 0.731688$

$= 0.13433$

Scanned with CamScanner

3rd iteration

$a = 0.75, b = 0.5$

$f(a) = \sqrt{0.75} - \cos(0.75)$

$= 0.13433$

$f(b) = \sqrt{0.5} - \cos(0.5)$

$= -0.1704$

$x = \frac{a+b}{2} = \frac{0.75+0.5}{2} = \frac{1.25}{2}$

$x = 0.625$

$f(0.625) = \sqrt{0.625} - \cos(0.625)$

$= 0.79056 - 0.810963$

$= -0.02040$

$\boxed{\text{The root is } 0.625}$

Scanned with CamScanner

Q3 $f(x) = x^3 - 7x^2 + 14x - 6 = 0$

$(0, 1)$ $a = 0$, $b = 1$

1st iteration:

$f(a) = 0^3 - 7(0)^2 + 14(0) - 6 = 0$

$= -6$

$f(b) = 1^3 - 7(1)^2 + 14(1) - 6 = 0$

$= 1 - 7 + 14 - 6$

$= -6 + 14 - 6$

$= -12 + 14 \Rightarrow 2$

$x = \frac{a+b}{2} = \frac{0+1}{2} = \frac{1}{2} = 0.5$

$f(0.5) = (0.5)^3 - 7(0.5)^2 + 14(0.5) - 6$

$= 0.125 - 7(0.25) + 7 - 6$

$= -0.625$

2nd iteration:

$a = 0.5$, $b = 1$

$f(0.5) = (0.5)^3 - 7(0.5)^2 + 14(0.5) - 6$

$= -0.625$

$f(b) = 1^3 - 7(1)^2 + 14(1) - 6$

$= 1 - 7 + 14 - 6$

$= 2$

Scanned with CamScanner

$$x = \frac{a+b}{2} = \frac{0.5+1}{2} = \frac{1.5}{2} = 0.75$$

$$f(0.75) = (0.75)^3 - 7(0.75)^2 + 14(0.75) - 6$$

$$= 0.984375$$

3rd iteration:

$$a = 0.5, \quad b = 0.75$$

$$f(0.5) = 0.5^3 - 7(0.5)^2 + 14(0.5) - 6$$

$$= -0.625$$

$$f(0.75) = (0.75)^3 - 7(0.75)^2 + 14(0.75) - 6.$$

$$= 0.984375$$

$$x = \frac{a+b}{2} = \frac{0.5 + 0.75}{2} = \frac{1.25}{2}$$

$$x = 0.625$$

$$f(0.625) = 0.625^3 - 7(0.625)^2 + 14(0.625) - 6$$

$$= \cancel{0.24414} = 0.259765$$

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4th iteration:

$a = 0.625$, $b = 0.5$

$f(0.5) = 0.5^3 - 7(0.5)^2 + 14(0.5) - 6$

$= -0.625$

$f(0.625) = 0.625^3 - 7(0.625)^2 + 14(0.625) - 6$

$= 0.259765$

$x = \frac{0.625 + 0.5}{2} = \frac{1.125}{2} = 0.5625$

$f(0.5625) = 0.5625^3 - 7(0.5625)^2 + 14(0.5625) - 6$

$= -0.161$

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3rd iteration:

$$a = -1.125, \quad b = -0.25$$

$$f(a) = 3(-1.125+1)(-1.125-\tfrac{1}{2})(-1.125-1)$$

$$= 3(-0.125)(-1.625)(-2.125)$$

$$= -1.2949$$

$$f(b) = 3(-0.25+1)(-0.25-\tfrac{1}{2})(-0.25-1)$$

$$= 2.109375$$

$$x = \frac{a+b}{2} = \frac{-1.125-0.25}{2} = \frac{-1.375}{2}$$

$$x = -0.6875$$

$$f(-0.6875) = 3(-0.6875+1)(-0.6875-1)(-0.6875-1)^2$$

$$= 1.87866$$

$$\boxed{\text{The root is } -0.6875}$$

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