1,1)

$v(t=0) = 0$

$$\frac{dv}{dt} = g - \frac{C_d}{m} v^2$$

$$\times \frac{m}{C_d}$$

$$\frac{m}{C_d} \cdot \frac{dv}{dt} = \frac{m}{C_d} g - v^2$$

misal $a = \sqrt{mg/C_d}$

$$\frac{m}{C_d} \cdot \frac{dv}{dt} = a^2 - v^2$$

diintegralkan

$$\int \frac{dv}{a^2 - v^2} = \int \frac{C_d}{m} dt$$

$$\int \frac{dx}{a^2 - x^2} = \frac{1}{a} \tanh^{-1} \frac{x}{a}$$

$$\frac{1}{a} \tanh^{-1} \frac{v}{a} = \frac{C_d}{m} t + C$$

Jika $v=0$ di $t=0$, maka $\tanh^{-1}(0) = 0$

$$\frac{1}{a} \tanh^{-1} \frac{v}{a} = \frac{C_d}{m} t$$

$$v = \sqrt{\frac{gm}{C_d}} \tanh\left(\sqrt{\frac{gC_d}{m}} t\right)$$

1,3) Balance = Prev. balance + Deposit − Withdraw

Balance = 1512,33 + 220,13 − 327,26

= 1405,20

Date	Deposit	Withdrawal	Balance
1 Mei			1512,33
	220,13	327,26	
1 Juni			1405,20
	216,80	378,61	
1 Juli			1234,39
	350,25	106,80	
1 Agust			1586,84
	127,31	450,61	
1 Sept			1363,54

1,4) $t=12$, analytical solution = 50,6175

Step	v(12)	absolute relative error
2	51,6008	1,94 %
1	51,2008	1,15 %
0,5	50,9259	0,61 %

abs. relative error = $\left| \frac{\text{analytical} - \text{numerical}}{\text{analytical}} \right| \times 100$

4. 9) $y = 1,37^3 - 7(1,37)^2 + 8(1,37) - 0,35 = 0,043053$

a. 3-digit Chopping

$1,37^3 \rightarrow 2,571353 \rightarrow 2,57$

$-7(1,37)^2 \rightarrow -7(1,87) \rightarrow -13,0$

$8(1,37) \rightarrow 10,96 \rightarrow 10,9$

$-0,35$

$-0,12$ +

Error nya $= \left| \frac{0,043053 - 0,12}{0,043053} \right| = 178,7\%$

b. 3-digit Chopping

$y = ((1,37 - 7)1,37 + 8)1,37 - 0,35$

$y = (-5,63 \times 1,37 + 8)1,37 - 0,35$

$= (-7,71 + 8)1,37 - 0,35$

$= 0,29 \times 1,37 - 0,35$

$= 0,397 - 0,35$

$= 0,047$

Error nya $= \left| \frac{0,043053 - 0,047}{0,043053} \right| = 9,2\%$

4.11) Nilai $\cos(\pi/4) = 0,707107\ldots$ ← cos (45°)

0. $\cos\left(\frac{\pi}{4}\right) = 1$

$$\varepsilon_t = \left|\frac{0,707107 - 1}{0,707107}\right| 100\,\% = 41,42\,\%$$

1. $\cos\left(\frac{\pi}{4}\right) = 1 - \frac{(\pi/4)^2}{2} = 0,691575$

$$\varepsilon_t = \left|\frac{0,707107 - 0,691575}{0,707107}\right| 100\,\% = 2,19\,\%$$

$$\varepsilon_a = \left|\frac{0,691575 - 1}{0,691575}\right| 100\,\% = 44,6\,\%$$

2. $\cos\left(\frac{\pi}{4}\right) = 0,691575 + \frac{(\pi/4)^4}{24} = 0,707429$

$$\varepsilon_t = \left|\frac{0,707107 - 0,707429}{0,707107}\right| 100\,\% = 0,456\,\%$$

$$\varepsilon_a = \left|\frac{0,707429 - 0,691575}{0,707429}\right| 100\,\% = 2,24\,\%$$

3. $\cos\left(\frac{\pi}{4}\right) = 0,707429 - \frac{(\pi/4)^6}{720} = 0,707103$

$$\varepsilon_t = \left|\frac{0,707107 - 0,707103}{0,707107}\right| 100\,\% = 0,0005\,\%$$

$$\varepsilon_a = \left|\frac{0,707103 - 0,707429}{0,707103}\right| 100\,\% = 0,046\,\%$$

Karena $\varepsilon_a < 0,5\,\%$, Iterasi stop disini.

5.5) Akar $f(x) = -12 - 21x + 18x^2 - 2{,}75x^3$

Metode Grafik, cek titik potong sb-x dan sb-y

$x = -0{,}4$, $2{,}25$ dan $4{,}7$

Bisection

1. $x_r = \frac{-1+0}{2} = -0{,}5$

   $f(-1)\, f(-0{,}5) = 29{,}75\,(3{,}34375) = 99{,}47656$

2. $x_r = \frac{-0{,}5+0}{2} = -0{,}25$

   $\varepsilon_a = \left|\frac{-0{,}25-(-0{,}5)}{-0{,}25}\right| 100\,\% = 100\,\%$

   $f(-0{,}5)\, f(-0{,}25) = 3{,}34375\,(-5{,}5820313) = -18{,}6649$

3. $x_r = \frac{-0{,}5+(-0{,}25)}{2} = -0{,}375$

   dst .... $\varepsilon_a = 33{,}33\,\%$

False Position

1. $x_r = 0 - \frac{-12\,(-1-0)}{29{,}75-(-12)} = -0{,}2874251$

   $f(-1)\, f(-0{,}287425) = 29{,}75\,(-4{,}4117349) = -136{,}2491$

2. $x_r = -0{,}287425 - \frac{-4{,}4117349\,(-1-(-0{,}287425))}{29{,}75-(-4{,}4117349)} = -0{,}3794489$

   $\varepsilon_a = \left|\frac{-0{,}3794489-(-0{,}2874251)}{-0{,}3794489}\right| 100\,\% = 24{,}25\,\%$

   $f(-1)\, f(-0{,}3794489) = 29{,}75\,(-1{,}2896639) = -38{,}3675$

3. $x_r = -0{,}405232$

   $\varepsilon_a = \left|\frac{-0{,}405232-(-0{,}3794489)}{-0{,}405232}\right| 100\,\% = 6{,}36\,\%$

   dst

5.6) $\sin x = x^2$

$f(x) = \sin x - x^2$

Bisection

1. $X_r = \frac{0,5+1}{2} = 0,75$

$f(0,5)\, f(0,75) = 0,229426\ (0,1191388) = 0,027333$

2. $X_r = \frac{0,75+1}{2} = 0,875$

$\varepsilon a = \left|\frac{0,875-0,75}{0,875}\right| 100\,\% = 14,29\,\%$

$f(0,75)\, f(0,875) = 0,1191388\ (0,0019185) = 0,000229$

3. $X_r = \frac{0,875+1}{2} = 0,9375$

$\varepsilon a = \left|\frac{0,9375-0,875}{0,9375}\right| 100\,\% = 6,67\,\%$

$f(0,875)\, f(0,9375) = -0,0728251$

dst.