Lecture 7 - Tips

$$
\begin{aligned}
x_0 + 2\sin(x_1 - x_0) - \exp(-\sin(x_1 + x_0)) &\equiv 0 \\
x_0\cos(x_1) + \sin(x_0) - 1 &\equiv 0
\end{aligned}
$$

- Visualise the system of equations (maybe plot it)
- Understand chapter 9.6 and 9.7
  - Pages 477-482 explain the Newton method from Henrik's slides
- Find solvers in *'roots_multidim.h'*
- Insert in own code

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\end{aligned}
$$

```
i): State results with x0=1 and x1=1
Left hand side results:          Vector 2D:
        0.597193        0.381773
```

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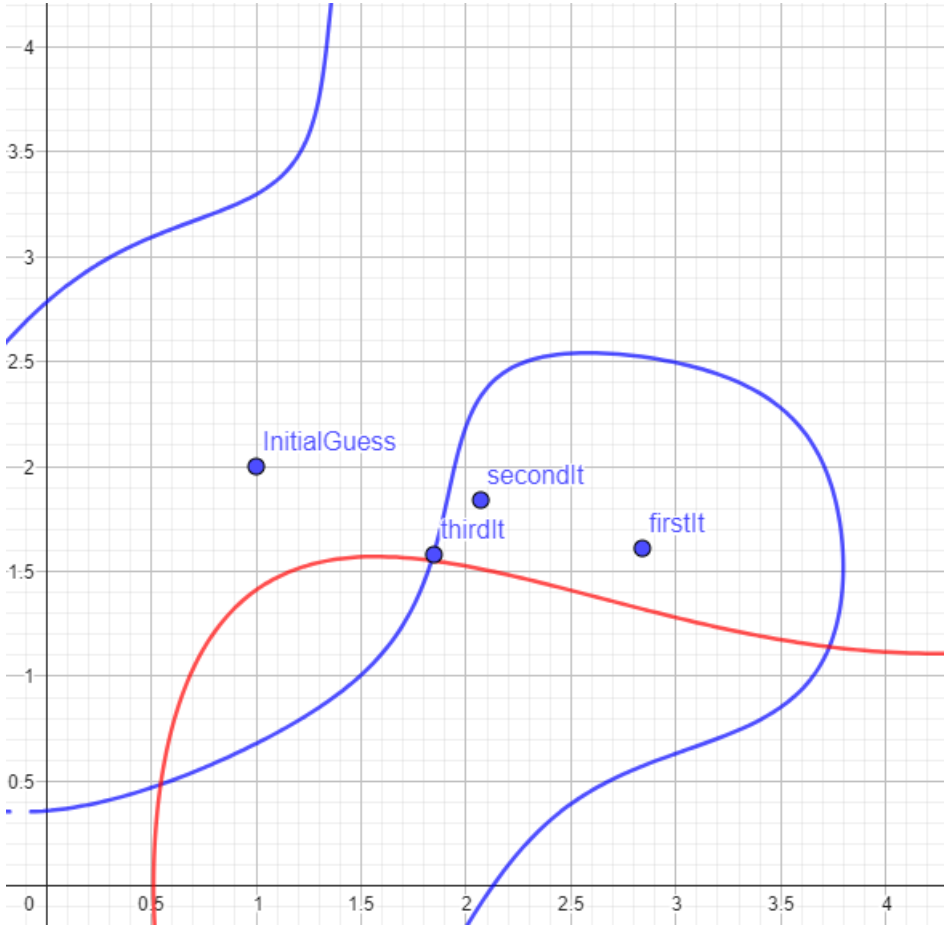

iii): Find multidim roots with newton method for initial guess x0=1 and x1=2

k	x0	x1	dx_k	d
1	1	2	2.23607	
2	2.84032	1.61928	1.87929	
3	2.07841	1.84125	0.79358	
4	1.85229	1.58609	0.340937	
5	1.83619	1.55209	0.0376177	
6	1.83564	1.5518	0.000620493	

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\end{aligned}
$$

Method	Expected Order	Estimate of C	Estimate of $\lvert\epsilon_k\rvert$
Newton	2	$\frac{\lVert d_k\rVert}{\lVert d_{k-1}\rVert^2}$	$C\lVert d_k\rVert^2$ or $\lVert d_k\rVert$

```
iii): Find multidim roots with newton method for initial guess x0=1 and x1=2
                  k             x0             x1              dx_k     dx_k/dx_(k-1)²              e
                  1              1              2           2.23607                inf            inf
                  2        2.84032        1.61928           1.87929           0.375858        1.32743
                  3        2.07841        1.84125           0.79358             0.2247       0.141509
                  4        1.85229        1.58609          0.340937           0.541368      0.0629277
                  5        1.83619        1.55209         0.0376177           0.323626    0.000457961
                  6        1.83564         1.5518       0.000620493           0.438482       1.68821e-07
iv): Error estimation on Newton root finding.
```

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