1) ORIGIN := 1 $\quad n := 8 \quad i := 1..n \quad j := 1..n$

$$V_{i,j} := i^{j-1} \qquad b_i := i^6$$

$$V = \begin{pmatrix} 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 \\ 1 & 2 & 4 & 8 & 16 & 32 & 64 & 128 \\ 1 & 3 & 9 & 27 & 81 & 243 & 729 & 2187 \\ 1 & 4 & 16 & 64 & 256 & 1024 & 4096 & 16384 \\ 1 & 5 & 25 & 125 & 625 & 3125 & 15625 & 78125 \\ 1 & 6 & 36 & 216 & 1296 & 7776 & 46656 & 279936 \\ 1 & 7 & 49 & 343 & 2401 & 16807 & 117649 & 823543 \\ 1 & 8 & 64 & 512 & 4096 & 32768 & 262144 & 2097152 \end{pmatrix}$$

Use format to change to decimal.

$$\text{cond2}(V) = 9.521 \times 10^{8}$$

Expect a relative error of 10^{-8}

$$x := \text{lsolve}(V, b) = \begin{pmatrix} -1.997 \times 10^{-10} \\ 5.072 \times 10^{-10} \\ -4.923 \times 10^{-10} \\ 2.408 \times 10^{-10} \\ -6.518 \times 10^{-11} \\ 9.878 \times 10^{-12} \\ 1 \\ 2.526 \times 10^{-14} \end{pmatrix}$$

Better than expected

2)

$r := 1\,m$ $\qquad h := 1\,m$

$V(r,h) := \pi \cdot r^2 \cdot h$ $\qquad A(r,h) := 2\cdot\pi\cdot r\cdot h + 2\pi r^2$

Given

$V(r,h) > 2m^3$

$sol := \text{Minimize}(A, r, h)$

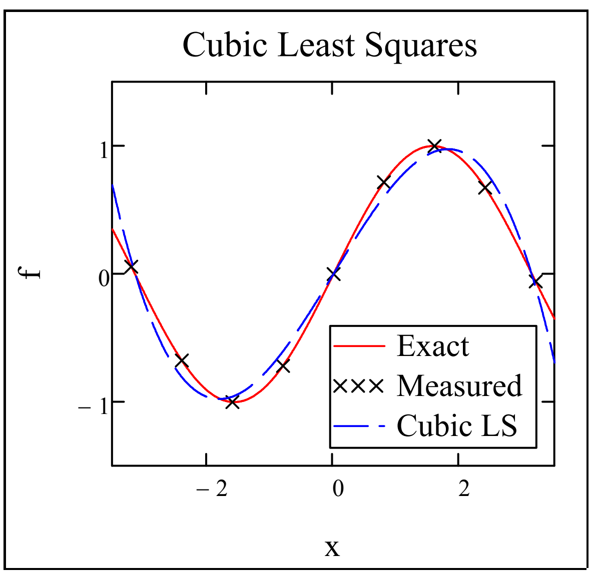
$sol = \begin{pmatrix} 0.683 \\ 1.366 \end{pmatrix} m$ $\qquad \boxed{r := sol_1 = 0.683\,m}$ $\qquad \boxed{h := sol_2 = 1.366\,m}$

3) $i := 1 .. 9$ $\quad t_{m_i} := -4 + i \cdot 0.8$ $\quad f_{ex}(t) := \sin(t)$ $\quad f_m := f_{ex}(t_m)$

$$t_m = \begin{pmatrix} -3.2 \\ -2.4 \\ -1.6 \\ -0.8 \\ 0 \\ 0.8 \\ 1.6 \\ 2.4 \\ 3.2 \end{pmatrix} \qquad f_m = \begin{pmatrix} 0.058 \\ -0.675 \\ -1 \\ -0.717 \\ 0 \\ 0.717 \\ 1 \\ 0.675 \\ -0.058 \end{pmatrix}$$

$$funcs_{cls}(t) := \begin{pmatrix} 1 \\ t \\ t^3 \end{pmatrix} \qquad C_{qls} := \mathrm{linfit}(t_m, f_m, funcs_{cls}) = \begin{pmatrix} 0 \\ 0.809 \\ -0.082 \end{pmatrix}$$

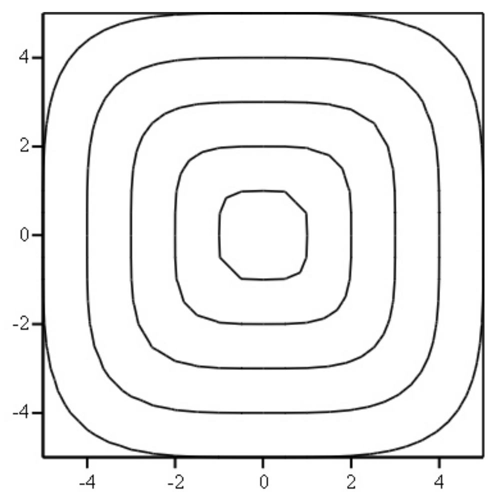
$$f_{cls}(t) := C_{qls} \cdot funcs_{cls}(t)$$



4)

$$f(xx,yy) := \left(xx^4 + yy^4\right)^{\frac{1}{4}}$$

$$f(xx,yy) = 1 \text{ solve}, yy \rightarrow \begin{bmatrix} (-1)^{\frac{1}{4}}\cdot(xx-1)^{\frac{1}{4}}\cdot(xx+1)^{\frac{1}{4}}\cdot\left(xx^2+1\right)^{\frac{1}{4}} \\ -(-1)^{\frac{1}{4}}\cdot(xx-1)^{\frac{1}{4}}\cdot(xx+1)^{\frac{1}{4}}\cdot\left(xx^2+1\right)^{\frac{1}{4}} \\ (-1)^{\frac{1}{4}}\cdot(xx-1)^{\frac{1}{4}}\cdot(xx+1)^{\frac{1}{4}}\cdot\left(xx^2+1\right)^{\frac{1}{4}}\cdot i \\ -(-1)^{\frac{1}{4}}\cdot(xx-1)^{\frac{1}{4}}\cdot(xx+1)^{\frac{1}{4}}\cdot\left(xx^2+1\right)^{\frac{1}{4}}\cdot i \end{bmatrix}$$



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