Thu Apr 21

Thursday, April 21, 2022 1:07 PM

AA/ECE/ME 548 Linear Multivariable Control Sp22 Prof Burden

today:
- ☑ course logistics, Canvas, etc
- ☑ exam 1 next week
- ☐ HW 2 self-assessment – due next Monday
- ☑ HW 3 – due this Friday
- ☑ week 4 lectures
- ☐ questions / office hours

probably I need to remove 2π from HW

- ☑ HW1 solution ⇝ Canvas
- ☐ 2π in p1(a)

TODO:
- ☐ link notebooks / point to Python intro
- ☐ ECE Colloq ☐ Robotics Colloquium ☐ Northwest Robotics Symp.
- ☐ HW 2 1(e) explanation

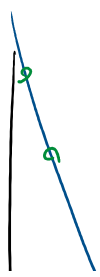
Consider the following cost function of a scalar decision variable $u \in \mathbb{R}$:

$$J(u) = \frac{u^6}{6} - \frac{7u^5}{5} + \frac{17u^4}{4} - \frac{17u^3}{3} + 3u^2.$$

(a) *Plot $J(u)$, $DJ(u)$, and $D^2J(u)$ versus u; use the subplot(3,1,n) for n = 1, 2, 3 to align the u-axes of the three plots.*

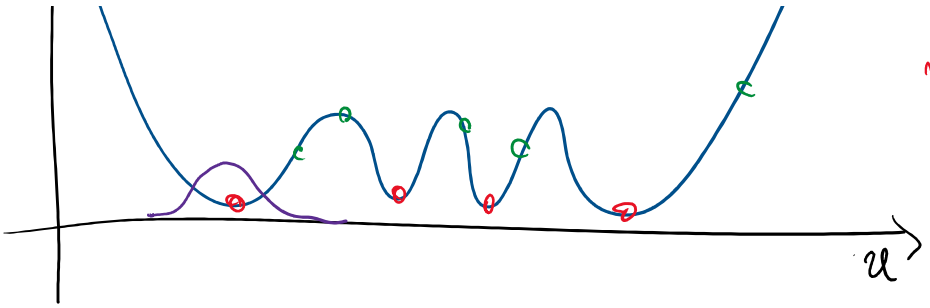
(b) *Determine all local minima of J and the corresponding minimizing u.*

(c) *Run the gradient descent iteration $u^+ = u - \alpha\, DJ(u)$ starting from multiple initial u's and with multiple values of the parameter $\alpha > 0$. Describe all of the outcomes (i.e. asymptotic behavior of the iteration) you observe and provide plots that illustrate these outcomes.*

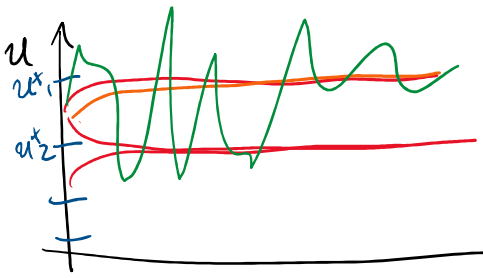


Q: do outcomes change if we consider

$\min_{v=-u} J(-v)$



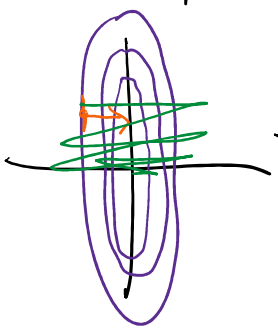
$\min_{N=-u} \bar{J}(-N)$



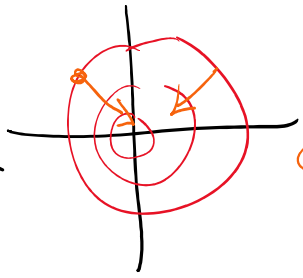
iteration

ex: $J(u) = u^T \begin{bmatrix} 1 & 0 \\ 0 & \varepsilon \end{bmatrix} u$

$\varepsilon \ll 1$



$\varepsilon \simeq 1$



$\varepsilon \gg 1$