**Unsupervised Learning Methods 2022  
Problem Set I –  
Optimization**

**Or Livne – 203972922**

**??? -???????**

1. **Convexity**

* In order to prove convexity needed to show that:
  + for set S, any x, y , and a , ax+(1-a) y

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* Let be x, y , needed to show that ax+(1-a) y, where a
  + For the edge case a=1\a=0 it is clear that z = ax+(1-a) y, by definition that be x, y
  + For the case a , in order that z
    - a , 1-a >0 because a
    - because x, y , because summation of positive number is positive, we show that

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\*

* we will prove that convex combination is convex by induction
  + for induction assumption n=1
  + Now let assume the correctness for N-1, and show it stand for N
  + Let define a scalar
  + ()z+ , because of summation of convex and the scalars summed to 1.
  1. תמונה שמכילה טקסט

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* We will disapprove the sentence:
  + Let z = (1000,1000)
  + {[-4,16], [-3,9], [-2,4],[-1,1],[0,0],[1,1],[2,4],[3,9],[4,16],[5,25]}
  + There is no linear combination which stand in

1. **The Gradient:**

* **The directional derivative off at is given by:**

* By definition we know that:
  + Let's define ,we need to find
  + Let's define , the 1 is in the i index
  + By definition = (\*)
  + This operation can be done for any {} for any i

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* **By definition:**

**4. Constraint optimization**

**G (x, y) = sin(x + y)**

* 1. **({G (x, y)}} =1**
  + **🡪 G''<0🡪min**
  + **For even 🡪 G''>0 🡪 max**
  + **Correct for 4.1+4.2 (\*)**
  1. **( {G(x, y)}} = -1**
* **Because of (\*)**

תמונה שמכילה טקסט

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1. **Needs to find the min of**

* **If x is a solution thus b\*x is also a solution, where b!=0**
  + **Base on the sentence we can say that is also a solution, and thus we can say that the equivalent problem is what we needed to show with constrain that**

1. Lagrangian of the constraint objective

* L(x,) =

1. **.**

* **🡪**
* **🡨** 
  + **Ax = 🡪 f(x) = = 🡪**