Solution of the quiz

Problem 1 Answer: (

Details

O Because we want to <u>maximize</u> the distance between the position of the vehicle at time T (given by Ex(T)) and point b, we must minimize the negative of this quantity.

Problem 2 Answers A

<u>Details</u>

- 1 Note that all the six functions are continuous and coarcive. Thus, they all have (at least) one plobal minimizer.
- 2 Let's start by looking at the function in option A: far = ex + 1/2 |x1.

The candidates for being global minimiters are the points NOS, where

- · N = set of points at which firs not differentiable
- . S= set . of stationary points of f (points at which fox)=0).

For the set N, we have N= [0.].

For the set S, we must solve fox)= a with x to:

· case x>0 here, fox) = ex + 1/2 x; thus, fox) = ex+1/2.

This gives the equation $e^{x} = -1/2$, which does not have a solution for x>0 (in fact, for no xer);

· case x<0 here, fix = ex - 1/2x; thus, fix = ex - 1/2.

This gives the equation ex=112, which has the

solution x2:-10 2 (which we accept because x20).

The set of candidates is C=20, -log 29.

We now evaluate for those points:

· f(0) = e0 +/2101 = 1

· f(-log 2) = e(-lg2) + 121-lg21 = 12+12 log2

Because f(-log 2) < f(0), we conclude that o is not a global minimizer of f.

(We also found something extre: the global minimizer is x*=-lg 2.)

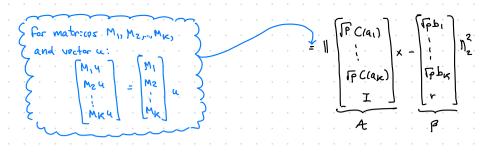
3) For the functions in options B,C,D,E, and F, we always have N=fog and S=\$. Thus, for those functions, we just have one candidate, x = 0, which must be there fore the plobal minimizer.

Answer: C

1) Note that C(u) v = C(v) u for any vectors 4, v & R"

(this is easily verified and highly suggested by looking at the

avoilable options)



Problem D Answer: C

Details 1 Note that DIWN = DIV) a for any vectors uneix

(2) We have

f(x) = 11 (A+RD(x)) 0 + 6112

observe that the fiven optimization problem; thus, there is a field minimizer

3 Because there is a global minimizer and f is differentiable everywhere, the global minimizer is to be found in S=[x: \forall ftx]=0.4.

- D(0) (RTP) RT (A0+b)

(+ p(x)=x7Mx+p7x

We now focus on solving oftx)=0:

Bito for all is RTR is invertible because Ris full adummrank]