

Reading Comprehension

Passage 17

This sample text has been prepared for the Master of Electrical Engineering entrance exam by Alpha Consulting Group.

Convexity is essential to modern optimization theory. However, it is not always the natural property to be expected from many nonlinear phenomena. Another property, perhaps at least as pervasive in the real world as convexity, is monotonicity. Monotonic optimization, or more generally d.m. (difference of monotonic) optimization, is concerned with nonconvex optimization- problems described by means of monotonic and d.m. functions. The basic problem of d.m. Optimization is maximization of a monotonic function under monotonic constraints. In the last few years, a theory of monotonic optimization has emerged which provides a general mathematical framework for the study of these problems.

There is a striking analogy between several basic facts from monotonicity theory and convexity theory, so that monotonicity can be regarded as abstract convexity, using a term coined by Singer in 1997.

From the point of view of modern optimization theory-, a fundamental property of convex sets is the separation property which states that any point lying outside a closed convex set can be separated from it by a half-space. The geometric object analogue to a convex set is a downward set which is the lower level set of an increasing function.

Questions

1- According to the sentence "Another property, perhaps at least as pervasive in the real world as convexity, is monotonicity.", we can conclude that:

- 1) Monotonicity is as vital as convexity in the real world.
- 2) Monotonicity is as widespread as convexity in the real world.
- 3) Monotonicity is as useful as convexity in the real world.
- 4) Monotonicity is as important as convexity in the real world.

2- According to the text:

- 1) Although nonlinear phenomena are not necessarily convex, they all have the monotonicity property.
- 2) Convexity is a necessary condition for monotonicity.
- 3) The theoretic aspects of monotonicity and convexity have impressive similarities.
- 4) Convexity is a generalized monotonicity.

3- What does "coined" in "A term coined by Singer" mean?

- 1) Copied 2) Spanned 3) Created 4) Optimized

4- What does the author mean by "monotonic constraints"?

- 1) The half space separated from a convex set.
2) Monotonic functions which exhibit the separation property.
3) Monotonic functions which are not convex.
4) The limitations imposed to the problem due to monotonicity.

Answers

$$1 \implies 2$$

$$2 \implies 3$$

$$3 \implies 3$$

$$4 \implies 4$$