What is Artificial Intelligence

Can AI solve it?

1. Play a decent game of table tennis (ping pong)
   Yes, if you have a specialised hardware system specifically for this task. Won't be able to beat world champion for a while

2. Drive in the centre of Cairo, Egypt
   No. Self driving cars are becoming much better, but still can't handle very complex traffic with cars, bikes and pedestrians weaving in and out.

3. Drive along a winding mountain road
   Mostly yes.

4. Play games such as Chess, Go, Bridge or Poker
   Yes, with a lot of human effort in building the AI game players.

5. Discover & prove new mathematical theorems
   Yes, but not with the same creativity as humans. Computers have been used to assist in complex proofs not previously possible.

6. Compose a piece of music, or paint a painting
   Yes, but you probably couldn't listen to it for very long. Again with human effort behind it.

7. Write an intentionally funny story
   Much harder.

8. Give competent legal advice in a specialised area of law
   I wouldn't hire a robot lawyer yet.

9. Translate spoken English into Chinese (or Swedish) in real time
   Yes, but you'll be laughing at the result.

10. Perform a complex surgical operation
    Only guided by a human surgeon

Embodied Agents

Suppose you have been asked to form a new team to compete in the RoboCup SPL. You are given the robot, with only a basic Linux operating system, without any software to actually run the robot. What are the main software modules that the team has to write to get a team of five robots to play. They can communicate with each other but WiFi, but you are not allowed to control them remotely.

The aim of this question is to get you to think about all the interconnecting components that are needed to create an autonomous robot. It must be able to:

1. *Perceive its environment. The Nao has cameras that can be used to detect the ball (how? colour, size, shape), the field lines (line detection) and goals (how?) and other robots (even harder, why? funny shapes). It must deal with different lighting conditions, occlusions, noise (far away objects will be small and only a few pixels might make up, say, the ball).*
2. *Know where it is in relation to the field and to the ball and other robots. How do you measure distance (with a mono camera). The camera has a narrow field of view that can only see parts of the field, so how can you work out which part you are seeing). How do you create a map of the field?*
3. *Be able to move around. Bipedal walking is inherently unstable. How do you use the foot pressure sensors and accelerometers in the chest to stay balanced? How do you take steps without falling over?*
4. *Play a game of soccer. A simple problem is if there is only one robot on the field and one ball, what should the robot do (in detail).*
5. *Work in a team. How do you get the robots to cooperate with each other? What game playing strategies should the robots adopt when there is more the one robot on the team and there are opponent robots. What information should be conveyed between the robots (they can communicate via WiFi but they are not allowed to get any help from a coach off the field).*

There are many other aspects of robotics that you might think of that come into writing the software for a soccer playing robot.