1. (14 points)  Provide an general explanation of what can be computed and what cannot along with what is considered unknown.

Computing means using processes, techniques, and machinery to process information usually displayed in the forms of bits. Computers today can process mathematical equations and simple procedures that require little to no actual processing to decipher. As you start trying to process something severely complex or something that takes magnitudes of computing that’s when you start not being able to compute it. An example from the readings and videos were trying to understand the effect of caffeine on the human brain, something that is severely complex and would take a normal computer a really long time to even get close to solving.

1. (9 points each)  Based upon each of the scenarios provided below, provide a justification to be provided to a supervisor of whether or not it can be computed definitively.  If it can be computed definitively, provide a textual algorithm (not specific to code; English explanation) for how it can be done.  If it cannot be computed definitively, provide an explanation tying it to a problem that is undecidable (such as those discussed in the readings or search on the Internet).  If it cannot be computed definitively, but AI could assist in certain ways, also provide an explanation of what AI could do to assist. *If you're really not sure, provide your thought process on how you're thinking about the scenario as you likely know more than you initially think you do!  If you leave it blank, you can't earn any points for that scenario!*
   1. Scenario 1:  You are asked to write a program to be able to capture the process of how a doctor diagnoses their patient's illness(es).

This can be computable because it can define illnesses at subjects or variables that can be used in a checklist system to narrow down to the nearest illness, an example of this would be like WebMD.

An algorithm for this could have illnesses and conditions in a database and filter based on symptoms that the doctor finds:

Variable names: coughing, fever, runny nose, blood, sweating…

Algorithm can do a sort through illness where (symptoms == variable), if != coughing filters the illness.

* 1. Scenario 2:   You are asked to write a program to maximize traffic flow through a city's streets based upon humans driving about 50% of the cars and self-driving cars driving the other 50%.

This could be computable only if using maybe quantum computers computing, you would have to analyze or track each self-driving car and driver on the streets and how long it takes for each driver to down each road. Analyzing the fastest paths, you can redirect some of the traffic down those roads to help balance the traffic in the city. An example of this would be like Waze and google maps.

The type of algorithm you would need is to have a list of every street and average time across the street, if self-driving cars can be programmed which roads to drive on and humans drive normally or also follow a GPS based system, it will become a simple sort algorithm to send them on the fastest routes. But this would need to be analyzed constantly, which might be best suited for AI.

* 1. Scenario 3:  You are asked to write a program to assist with testing software.  The program you are to write is to analyze the code within any other program to determine what (if any) are the infeasible paths through it (because they won't need to be tested when using white-box testing techniques).

This becomes a computable program where you would have to take each input and run it through to see if all the nodes are activated at least once. Each node would be basically a decision line usually though an if statement, and a loop. If the program notices if a variable or a value is not used throughout the whole running of the code at least once, then it could find unused portions of the code.

* 1. Scenario 4:   You are asked to write a program to search through log files and find instances taking place at a certain time or by a certain user.

This could be computable because you can have the username stored in a variable and do simple parses through the information in the log files for instances of the username and then have those instance wrote to a log on which lines or even which dates, or files has instances of the username. As for the specific date you would have to find the date and time that is written in universal format or by time in 24 hr format ex: 16:00.

* 1. Scenario 5:  Your employer is interested in writing a script to determine whether the login by username is actually the intended user or an imposter who has received the user's username and current password through a social engineering attack.  The goal is to try to detect intrusions who gained access and block them before they are able to see or do anything within a system.

This one seems harder to compute, due to multiple factors that are needed. You would have to track IP addresses each user uses and maybe even mac addresses, plus know if there was a breach of passwords. You would also have to track things like two factor authentication too if that is being used which makes in almost infeasible for a simple program to learn information only a human could know. Also having access to the normal times when the user would log on could also help in computing the scenario.

The only way this could be computable would know if there was a breach of passwords, which databases were affected and immediately shut those usernames and passwords down from being able to access the system. This would take an incredible amount of processing power and almost no time to waste. That is the only way that would be feasible.

* 1. Scenario 6:  You are asked to write a program to allow users to be able to control their IoT devices made from the same company from a phone.

This scenario can be computable for sure because the user can connect their devices to wireless or some sort of program that the user can sign up. Then by connecting each device to an application an internet connection, all the algorithms would have to do is verify if that is the correct user then run through each device connected to verify which device the user selected. Then run the associated applications or controls with that device.

* 1. Scenario 7: You are asked to write a program to determine whether another file is malware.  The malware could be a virus, worm, or ransomware.

I think this could be an AI assisted computing due to the algorithm comparing each file against a database of known viruses and how each file acts. This could be assisted using AI because if trained how malware acts and what a file looks like when it is infected then the ai can do a search through each file and find patterns that would match the behavior of malware and quarantine it to be inspected. False positives could happen where files that aren’t malware could be mistaken for malware files.

<https://www.usnews.com/360-reviews/antivirus/how-does-antivirus-software-work>

* 1. Scenario 8:   You are asked to write a program to correctly identify people through facial recognition with only 5 points of comparison.

I feel like this would be an algorithm that would also need to use an AI for computing. According to CSIS, there are algorithms that can recognize faces with high amount of accuracy but there isn’t any discussion on how many points of comparison are needed to get that accuracy. Using an ai that can recognize each face and then train them to recognize them would probably be the best due to it learning the differences.

<https://www.csis.org/blogs/technology-policy-blog/how-accurate-are-facial-recognition-systems-%E2%80%93-and-why-does-it-matter>

1. (14 points) What are your thoughts on computability and the future?  Provide at least 3 main thought-provoking points or ideas and discuss each providing support for your thoughts.  Tie these to the Computability readings through citations or find appropriate references for citing.

Eventually the use of quantum computing would become more feasible and advanced to the point where quantum computers could be used by almost everyone in calculations. Quantum computing (from the readings and videos) give us an ideal of complex equations that could be solved in minutes. Ideas that could be solved in the future is better encryption methods, creation of new software and materials, and possibly medical advancements.

<https://insights.sap.com/6-surprising-innovations-for-the-future-of-computing/>

Another idea of future computing is how do we keep furthering speeds of microchips? Having faster microchips will help process data faster and being able to perform calculations that re not being able to be done today. As far as it’s going you can only shrink transistors small to a point, what will be the new idea after that? Creating nano technology should be something we see more in the future.

<https://www.nisenet.org/catalog/future-computing>

my last idea of the future is one of science fiction and one that could be of the future. As portrayed by Johnny Depp in *Transcendence*, eventually the ability to connect a human mind to a computer might eventually occur and have the computer read brain wave lengths and capture them. (SPOILERS) In the movie, a scientist uploads his thoughts and memories into a computer, and it becomes an AI that thinks, and acts like him. With the mind of a genius and the processing of a computer the “digital copy” of the scientist creates many advancements including how to replicate human organs using nano technology. I am not sure how far advanced that would go but being able to have human thoughts portrayed by a computer could be something of the future.

<https://www.thepourquoipas.com/post/the-next-big-thing-2050-technologies>

<https://www.imdb.com/title/tt2209764/>