1) Consider the following schema, where the key field(s) are underlined (e.g. sid is the key for Sailor), and the domain of each field is listed after the italicized field name. The Rent relation contains the dates Sailors rented a boat. Write the following queries in relational algebra. (2 pts. each)

\[
\begin{align*}
\text{Sailors} \quad (\text{sid: integer, sname: string, rating: integer, age: integer}) \\
\text{Boats} \quad (\text{bid: integer, bname: string, color: string}) \\
\text{Rent} \quad (\text{sid: integer, bid: integer, date: date})
\end{align*}
\]

1.1) Find the sids of sailors who rent a blue boat.
\[
\pi_{\text{sid}} ((\sigma_{\text{color}=\text{‘blue’}} \text{Boats}) \bowtie \text{Rent})
\]

1.2) Find the sids of sailors who rent a green boat and have a rating of 5.
\[
\pi_{\text{sid}} (((\sigma_{\text{color}=\text{‘green’}} \text{Boats}) \bowtie \text{Rent}) \bowtie (\sigma_{\text{rating}=5} \text{Sailors}))
\]

1.3) Find the bids of boats rented by every sailor with an age of 18. \textbf{(Hint: use division)}
\[
(\pi_{\text{bid, sid}} \text{Rent})/(\pi_{\text{sid}} (\sigma_{\text{age}=18} \text{Sailors}))
\]

2) Consider the Sailors-Boats-Rent schema from the previous question. State what the following queries compute. (2 pts. each)

2.1) \[
\pi_{\text{sname}} (((\sigma_{\text{color}=\text{‘red’}} \text{Boats}) \bowtie (\sigma_{\text{date}>\text{‘2019-04-25’} \text{and date}<\text{‘2019-04-30’}} \text{Rent})) \bowtie \text{Sailors})
\]
Find the names of the sailors who rented a red boat between ‘2019-04-25’ and ‘2019-04-30’.

2.2) \[
(\pi_{\text{sid}} ((\sigma_{\text{color}=\text{‘red’}} \text{Boats}) \bowtie \text{Rent})) \cap \\
(\pi_{\text{sid}} ((\sigma_{\text{color}=\text{‘blue’}} \text{Boats}) \bowtie \text{Rent})) \cap \\
(\pi_{\text{sid}} (\sigma_{\text{age}>21 \text{and rating}>7} \text{Sailors}))
\]
Find the sids of the sailors who are older than 21 and have a rating greater than 7 who rent a blue boat and a red boat.