Question 1: **10 Marks**

For each of these arguments, explain which rules of inference are used for each step.

1. "Doug, a student in this class, knows how to write programs in JAVA. Everyone who knows how to write programs in JAVA can get a high-paying job. Therefore, someone in this class can get a high-paying job."

   Sample Answer:

   Let $c(x)$ be "x is in this class,"
   $j(x)$ be "x knows how to write programs in JAVA," and
   $h(x)$ be "x can get a high-paying job."

   The premises are c(Doug), j(Doug), $\forall x(j(x) \rightarrow h(x))$.

   Using universal instantiation and the last premise, $j(\text{Doug}) \rightarrow h(\text{Doug})$ follows.

   Applying modus ponens to this conclusion and the second premise, h(Doug) follows.

   Using conjunction and the first premise, $c(\text{Doug}) \wedge h(\text{Doug})$ follows.

   Finally, using existential generalization, the desired conclusion, $\exists x(c(x) \wedge h(x))$ follows.

2. "Somebody in this class enjoys whale watching. Every person who enjoys whale watching cares about ocean pollution. Therefore, there is a person in this class who cares about ocean pollution."
3. "Each of the 93 students in this class owns a personal computer. Everyone who owns a personal computer can use a word processing program. Therefore, Zeke, a student in this class, can use a word processing program."
4. "Everyone in New Jersey lives within 50 miles of the ocean. Someone in New Jersey has never seen the ocean. Therefore, someone who lives within 50 miles of the ocean has never seen the ocean."

Due Date: **September 25 (At the start of your respective class)**

You may work in groups of 2-3 students; One submission is sufficient for the whole group
Only **Handwritten** Submissions would be considered for grading!!!

Question 2: **10 Marks**

You are given as input a (*propositional*) function "`bool P(int x, int y)`" and two arrays, `int D1[n]` containing elements of the domain of the first variable `'x'` and `int D2[m]` containing elements of the domain of the second variable `'y'`. Write a code fragment to determine the truth value of each of the following (*nested*) quantified statements:

i. $\forall x \forall y P(x, y)$

ii. $\forall x \exists y P(x, y)$

iii. $\exists x \forall y P(x, y)$

iv. $\exists x \exists y P(x, y)$

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