ID:_____   Name:_____

1. State which rule of inference is the basis of the following argument:

(a) It is below freezing now. Therefore, it is below freezing or raining now.

P premise

$P \lor q$

$$\frac{P}{\therefore P \lor q}$$

the rule of inference: Addition

(b) It is below freezing and raining now. Therefore, it is below freezing now.

P q (2 premises) P

$$\frac{P \land q}{\therefore P}$$

the rule of inference: Simplication

(c) If it rains today, then we will not have BBQ today. If we don't have BBQ today, we will
have a BBQ tomorrow. Therefore, if it rains today, then we will have a BBQ tomorrow.

P $\neg q$ $\neg q$ r

$$\frac{P \to \neg q \\ \neg q \to r}{\therefore P \to r}$$

The rule of Inference:
Hypothetical syllogism.

2. Show that the premises "It is not sunny this afternoon and it is colder than yesterday," "We
will go swimming only if it is sunny," "If we do not go swimming, then we will take a canoe
trip," and "If we take a canoe trip, then we will be home by sunset" lead to the conclusion
"We will be home by sunset."

$S:$ "It is sunny"
$C:$ "It is colder"
$m:$ "We'll go swimming"
$t:$ "we'll take a canoe trip"
$h:$ "We'll be home be sunset"

$\neg S \land C$ } Premise ①
$\neg S$ Simplication using Premise ①
$m \to S$ } Premise ②
$\neg m$ Modus Tollens using ②
$\neg m \to t$ } Premise ③
t Modus Ponens using "purple" premise
$t \to h$ }
$\therefore h$ Modus Ponens.

3. Fallacy:

Several common _fallacies_ arise in incorrect arguments. These fallacies resemble rules

of inference, but are based on **contingencies** rather than **tautologies**.
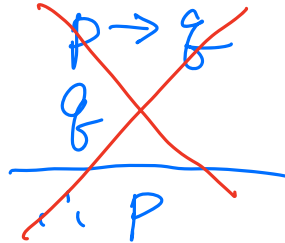
4. Fallacy of affirming the conclusion:

If you do homework, then you will learn Mat2440 well. You learned Mat2440 well.

Therefore, you did homework.

$p:$ "do homework"

$q:$ "learn Mat2440 well"

fallacy of affirming the conclusion

$$p \rightarrow q$$
$$q$$
$$\therefore p$$

$$(p \rightarrow q) \wedge q \Rightarrow p$$

5. Fallacy of denying the hypothesis:

If you do homework, then you will learn Mat2440 well. You don't do your homework.

Therefore, you won't learn Mat2440 well.