# In-Class Worksheet <br> Discrete Math \& Functional Programming- CSCI 054- Spring 2024 Instructor: Osborn 

Given an implication $p \Rightarrow q$, we can define the following related concepts:

- converse: $q \Rightarrow p$
- inverse: $\neg p \Rightarrow \neg q$
- contrapositive: $\neg q \Rightarrow \neg p$

Which, if any, are logically equivalent to the original implication?

If 2 is an even number, then 3 is an odd number

If $x$ is an even number, then $x+1$ is an odd number

Define the predicates:

- rested $(\mathrm{n})=$ " n got at least 8 hours of sleep in the past 24 hours"
- $\operatorname{bornMA}(\mathrm{n})=$ " n was born in Massachusetts"

Which, if any, of the following propositions is True? Justify your answer.

- $\exists \mathrm{n}$ in this room : rested( n )
- $\forall \mathrm{n}$ in this room : $(\operatorname{rested}(\mathrm{n}) \Rightarrow$ bornMA(n))
- $\exists \mathrm{n}$ currently enrolled at Pomona College : $(\operatorname{rested}(\mathrm{n}) \wedge$ bornMA(n))
- $\forall$ currently enrolled at Pomona College : (rested(n) $\vee$ bornMA(n))

Is the following a theorem? Explain.

$$
[\forall x \in S: P(x)] \vee[\forall x \in S: \neg P(x)]
$$

