Logical Symbols

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Read as</th>
</tr>
</thead>
<tbody>
<tr>
<td>&amp;</td>
<td>and</td>
</tr>
<tr>
<td>∨</td>
<td>or</td>
</tr>
<tr>
<td>→</td>
<td>if, then</td>
</tr>
<tr>
<td>↔</td>
<td>if and only if</td>
</tr>
<tr>
<td>¬</td>
<td>not</td>
</tr>
<tr>
<td>∀</td>
<td>For all x</td>
</tr>
<tr>
<td>∃</td>
<td>there exists some x</td>
</tr>
</tbody>
</table>

For all x, if x is F, then x is G
\[ ∀x \;Fx → Gx \]
A is F
\[ Fa \]
Thus, a is G
\[ ∴ Ga \]

Some Patterns of Valid Arguments

**Modus Ponens**
If A then B
\[ A → B \]
A
\[ A \]
Thus B
\[ ∴ B \]

**Modus Tollens**
If A then B
\[ A → B \]
Not B
\[ ~B \]
Thus not A
\[ ∴ ~A \]

**Disjunctive syllogism**
Either A or B
\[ A ∨ B \]
Not A
\[ ~A \]
Thus B
\[ ∴ B \]

**Hypothetical syllogism**
If A then B
\[ A → B \]
If B then C
\[ B → C \]
Thus if A then C
\[ ∴ A → C \]

**Contraposition**
If A then B
\[ A → B \]
Thus if not B then not A
\[ ∴ ~B → ~A \]

**An Invalid Argument Form**

**Denying the antecedent**
If A then B
\[ A → B \]
Not A
\[ ~A \]
Thus, Not B
\[ ~B \]
Some Fallacies

*Ad Hominem:* attacking character of author, not the argument itself

*Faulty analogy:* to claim that since A and B are alike in Φ they must be alike in Ψ

*Questionable authority:* supporting a conclusion with judgment of one who is not a reliable authority
   
   Why does anyone think that Michael Jordan knows if Gatorade is good for you?  
   Shouldn’t you ask a nutritionist?

*Begging the question:* to assume the conclusion in the premises
   
   This is a tough one to ferret out

*Equivocation:* an implicit reliance on two different meanings of the same word
   
   Example:  Some triangles are obtuse  
   If x is obtuse, then x is stupid  
   Some triangles are stupid

*Hand waving:* to claim x is true because everyone says x is true

*Hasty generalization:* reaching a general conclusion from too small of a sample
   
   I once saw a stupid person agree with the president, so only stupid people agree with the president

*Appeal to ignorance:* claiming a conclusion is true because we do not have evidence that it is false

*Post Hoc Ergo Propter Hoc:* claiming x caused y because x occurred before y

*Red herring:* introducing an irrelevant issue to distract attention from the real issue

*Straw person:* distortion of an opponents actual position in order to make it easy to discredit