In the proof below, what rule justifies the last step?

1. \((q \rightarrow r)\)  \hspace{0.5cm} \text{Premise}
2. \((p \rightarrow r)\)  \hspace{0.5cm} \text{Premise}
3. \(((p \lor q) \rightarrow r)\)  ??

A: \(\lor e\)
B: \(\rightarrow i\)
C: Some other rule, not listed.
D: No justification exists.
In the partial proof below, what formula should occur at line 3?

1. \((q \rightarrow r)\)  Premise
2. \((p \rightarrow r)\)  Premise
3. ???  Assumption

\[ \vdots \]

\[ n - 1. \]

\[ n. \quad ((p \lor q) \rightarrow r) \quad \rightarrow i \]

A: \(p\)  D: Any of those three.
B: \(q\)  E: Other.
C: \((p \lor q)\)
In the following proof, at which line does the first error occur?

1. \((p \rightarrow q)\)   Premise

2. \(p\)               Assumption

3. \(q\)               \(\rightarrow\)e: 2, 1

4. \(q\)               Reflexivity: 3

A: Line 2.
B: Line 3.
C: Line 4.
D: No error exists.
Suppose that a proof contains the formula

\[(p \rightarrow (q \lor r))\]

Of the four rules

→i, ∨i, ¬¬e, and ∨e,

how many could, in principle, be used to justify the formula?

A: None of the rules could be used.
B: One and only one.
C: Either of two of those.
D: Three, but not all four.
E: Any of the four.
In the proof at right, what rule(s) could be used at the last line, (to yield some formula $\varphi$)?

1. $(p \to r)$ Premise
2. $(q \to s)$ Premise
3. $(p \lor q)$ Premise
4. $p$ Assumption
5. $r$ $\to e: 1, 4$
6. $q$ Assumption
7. $s$ $\to e: 2, 6$
8. $\varphi$ ???

A: $\to i$
B: $\lor i$
C: $\lor e$
D: Two of the above (not the third)
E: Any of the above