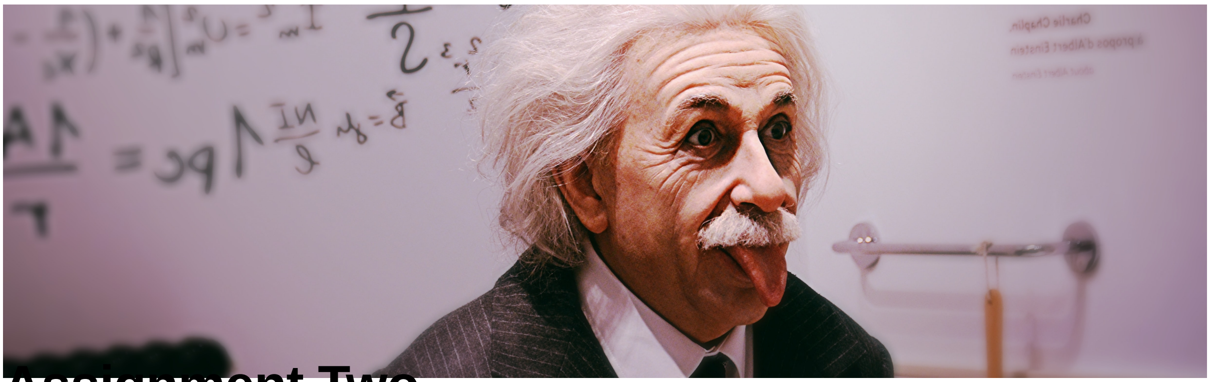

Assignment Two

▼ **Show that $(p \rightarrow r) \lor (q \rightarrow r)$ and $(p \land q) \rightarrow r$ are logically equivalent.**

p	q	r	$p \rightarrow r$	$q \rightarrow r$	$(p \rightarrow r) \lor (q \rightarrow r)$	$p \land q$	(p ∧
T	T	T	T	T	T	T	T
T	T	F	F	F	F	T	F
T	F	T	T	T	T	F	T
T	F	F	F	T	T	F	T
F	T	T	T	T	T	F	T
F	T	F	T	F	T	F	T
F	F	T	T	T	T	F	T
F	F	F	T	T	T	F	T

▼ **Translate each of these statements into logical expressions in three different ways by varying the domain and by using predicates with one and with two variables.**
a. A student in your school has lived in Vietnam.
b. There is a student in your school who cannot speak Hindi.
c. A student in your school knows Java, Prolog, and C++.
d. Everyone in your class enjoys Thai food.
e. Someone in your class does not play hockey.

a. A student in your school has lived in Vietnam.

1. Using one variable predicate and varying the domain:
   - Let P(x) be the predicate "x is a student in your school"
   - Let Q(x) be the predicate "x has lived in Vietnam"
   - logical expression : $\exists x(P(x) \land Q(x))$
2. Using one variable predicate and varying the domain:
   - Let P(x) be the predicate "x is a student in your school"
   - Let Q(x) be the predicate "x has lived in Vietnam"
   - Let the domain be all people
   - logical expression : $\sim\forall x(P(x) \lor Q(x))$

b. There is a student in your school who cannot speak Hindi.

1. Using one variable predicate and varying the domain:
   - Let P(x) be the predicate "x is a student in your school"
   - Let S(x) be the predicate "x who cannot speak Hindi"
   - logical expression : $\exists x(P(x) \land S(x))$

2. Using one variable predicate and varying the domain:
   - Let P(x) be the predicate "x is a student in your school"
   - Let S(x) be the predicate "x who cannot speak Hindi"
   - Let the domain be all people
   - logical expression : **$\sim\forall x(P(x) \lor S(x))$**

c. A student in your school knows Java, Prolog, and C++.

1. Using one variable predicate and varying the domain:
   - Let P(x) be the predicate "x is a student in your school"
   - Let R(x) be the predicate "x who knows Java, Prolog, and C++"
   - logical expression : **$\exists x(P(x) \land R(x))$**
2. Using one variable predicate and varying the domain:
   - Let P(x) be the predicate "x is a student in your school"
   - Let R(x) be the predicate "x who knows Java, Prolog, and C++"
   - Let the domain be all people
   - logical expression : **$\sim\forall x(P(x) \lor R(x))$**

d. Everyone in your class enjoys Thai food.

1. Using one variable predicate and varying the domain:
   - Let P(x) be the predicate "x is a student in your class"
   - Let T(x) be the predicate "x enjoys Thai food"
   - Then, the logical expression would be: **$\forall x(P(x) \rightarrow T(x))$**
2. Using one variable predicate and varying the domain:
   - Let P(x) be the predicate "x is a student in your class"
   - Let T(x) be the predicate "x enjoys Thai food"
   - Let the domain be all people
   - Then, the logical expression would be: **$\forall x(P(x) \land T(x))$**
3. Using one variable predicate and varying the domain:
   - Let P(x) be the predicate "x is a student in your class"
   - Let T(x) be the predicate "x enjoys Thai food"
   - Let the domain be all people
   - Then, the logical expression would be: **$\sim\exists x(P(x) \lor T(x))$**

e. Someone in your class does not play hockey.

1. Using one variable predicate and varying the domain:
   - Let P(x) be the predicate "x is a student in your school"
   - Let U(x) be the predicate "x who does not play hockey"
   - logical expression : **$\exists x(P(x) \land U(x))$**
2. Using one variable predicate and varying the domain:
   - Let P(x) be the predicate "x is a student in your school"
   - Let U(x) be the predicate "x who does not play hockey"
   - Let the domain be all people
   - logical expression : **$\sim\forall x(P(x) \lor U(x))$**