HW 1

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Problem 1.1. Let $x, y, z \in \mathbb{R}$

1. $\forall x \exists y \;\; s.t. \;\; x + y = 1$
True
Negation: $\neg(\forall x \exists y \;\; s.t. \;\; x + y = 1) = \exists x \forall y \;\; s.t. \;\; x + y \neq 1$

2. $\exists x \forall y \;\; s.t. \;\; x + y = 1$
True
Negation: $\neg(\exists x \forall y \;\; s.t. \;\; x + y = 1) = \forall x \exists y \;\; s.t. \;\; x + y \neq 1$

3. $\exists x \exists y \forall z \;\; s.t. \;\; yz = 1$
True
Negation: $\neg(\exists x \exists y \forall z \;\; s.t. \;\; yz = 1) = \forall x \forall y \exists z \;\; s.t. \;\; yz \neq 1$

Problem 1.2. Show that if a condition P is both necessary ($\overline{P} \Rightarrow \overline{Q}$) and sufficient (P $\Rightarrow$ Q), that this is logically equivalent to P = Q.

Problem 1.3. Let c,d be two single digit numbers, 0 $\leq$ c, d $\leq$ 9. We will create functions $f_1, f_2, f_3 ...$ that are as follows:

$$f_1(c,d) = cd$$
$$f_2(c,d) = cdcd$$
$$f_3(c,d) = cdcdcd$$
$$f_4(c,d) = cdcdcdcd$$
$$\vdots$$

References:
https://www.math.toronto.edu
https://math.stackexchange.com