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22C: 019 Homework 1

$\wedge \forall \neg \rightarrow \leftrightarrow \exists \forall$

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8.

- a. All rabbits hop.
- b. There is a rabbit that hops

10.

- c. $\exists x(C(x) \wedge F(x) \wedge \neg D(x))$
- d. $\neg \exists x(C(x) \wedge D(x) \wedge F(x))$

12.

- d. True
- f. True

16.

- c. True
- d. False

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24.

- a. $\forall x(F(x) \wedge C(x))$ where $C(x)$ x has a cellphone
- c. $\exists x(F(x) \wedge \neg S(x))$ where $S(x)$ x can swim

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20.

- b. $\forall x \forall y((x < 0) \wedge (y < 0) \rightarrow (xy > 0))$
- c. $\forall x \forall y(\text{abs}(x+y) \leq (\text{abs}(x) + \text{abs}(y)))$

32.

- a. $\forall z \exists y \exists x \neg T(x, y, z)$
- b. $\forall x \forall y \neg P(x, y) \vee \exists x \exists y \neg Q(x, y)$

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8. Let $n = a^2$, if $a = 0$, then $n+2 = 0+2$ which isn't a perfect square. a has to be greater or equal than 1. The smallest perfect square is $(a+1)^2$.
 $(a+1)^2 = a^2 + 2a + 1 = n + 2a + 1 \geq n + 2 + 1 > n + 2$

24. If we choose 2 days, it would account for almost 2.12, which equals 24 days, but we chose 25 days. This shows that at least 3 of the days must be on the same month.

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4.

a. $\{a,b,c,de,f,g,h\}$

b. $\{f,g,h\}$