Discrete Math, Semester 2019-2020-1, Quiz 1

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1. Are these system specifications consistent? "The system is in multiuser state if and only if it is operating normally. If the system is operating normally, the kernel is functioning. The kernel is not functioning or the system is in interrupt mode. If the system is not in multiuser state, then it is in interrupt mode. The system is not in interrupt mode." Give the reasoning procedure. (3 points)

2. Find a counterexample, if possible, to these universally quantified statements, where the domain for all variables consists of all integers. (2 points)

1)$\forall x \forall y(x^2 = y^2)$

2) $\forall x \exists y(y^2 = x)$

3) $\forall x \forall y(xy \geq x)$

3. Show that if you pick three socks from a drawer containing just blue socks and black socks, you must get either a pair of blue socks or a pair of black socks. (2 points)

4. Find a Boolean product of Boolean sums of literals that has the value 0 if and only if $x = y = 1$ and $z = 0$, $x = z = 0$ and $y = 1$, or $x = y = z = 0$. Then, use a K-map to find its minimal expansion. (3 points)