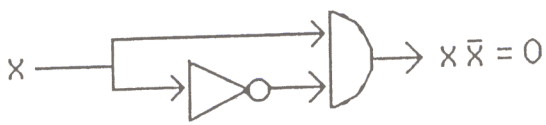
HW 10.4

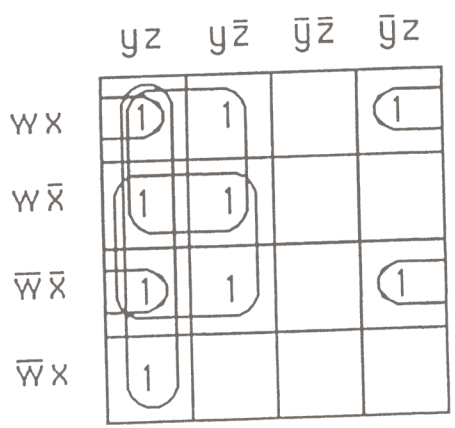
(6) c) First we must put the expression in its sum-of-products form, by "multiplying out." We have

$$\begin{aligned}\overline{x}\,y\,z\,((x+\overline{z})+(\overline{y}+\overline{z})) &= \overline{x}\,y\,z\,(x+\overline{y}+\overline{z}) \\ &= \overline{x}\,x\,y\,z+\overline{x}\,y\,\overline{y}\,z+\overline{x}\,y\,z\,\overline{z} \\ &= 0+0+0=0\,.\end{aligned}$$

This tells us that the circuit always has the output 0. In some sense the simplest circuit is the one with no gates, but if we insist on using some gates, then we can use the fact that $x\,\overline{x}=0$ and construct the following circuit.



(14)



$$y\,z + \overline{x}\,y + w\,y + w\,x\,z + \overline{w}\,\overline{x}\,z$$

(d)