Homework 1
Lewis Collum (Section 01)
Updated: January 31, 2020

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- S: Event of sensor triggering
- D: Event of dangerous conditions
- D^C: Event of normal conditions
- $P(D) = 0.05$
- $P(D^C) = 0.95$
- $P(S|D) = 0.95$
- $P(S|D^C) = 0.05$

(a) $P(S|D^C) = \boxed{0.05}$
(b) $P(D|S^C)$

$$\begin{aligned} P(S) &= P(S \cap D) + P(S \cap D^C) \\ &= P(S|D)P(D) + P(S|D^C)P(D^C) \\ &= 0.95 \cdot 0.05 + 0.05 \cdot 0.95 \\ &= 0.095 \end{aligned}$$

$$P(S^C) = 1 - P(S) = 0.905$$

$$\begin{aligned} P(D|S^C) &= \frac{P(D)P(S^C|D)}{P(S^C)} \\ &= \frac{P(D)(1 - P(S|D))}{P(S^C)} \\ &= \frac{0.05(1 - 0.95)}{0.905} \\ &= \boxed{0.0028} \end{aligned}$$

(c)
An unidentified critical condition since this means that the sensor would not alarm in the case of a dangerous event.