

38. None of us are unaware of the COVID-19 pandemic. There are a variety of tests for COVID-19. Consider the class of so called "molecular" tests, also called PCR tests, viral RNA tests, or nucleic acid tests. For all people taking this type of test who do not have COVID-19, these tests conclude the presence of COVID-19 (a so-called "false positive") for 5% of those tested. On the other hand, all people taking this type of test who do have COVID-19, the best of the tests will conclude they do not have COVID-19 (a "false negative") 2% of the time. At any given time, about 3% of the population is infected with COVID-19. Let D = the event a randomly selected tested person has COVID-19, and T = the event the person tests positive for COVID-19.

$$P(T|D^c) = 0.05 \quad P(T^c|D) = 0.02 \quad P(D) = 0.03$$

- (a) What is the probability a randomly selected person does not have COVID-19? Show and justify your work.
- (b) Suppose a person with COVID-19 is tested. What is the probability they test positive? Show and justify your work.
- (c) What is the probability a randomly selected person tests positive for COVID-19? Show and justify your work.