

Quiz 4

ECEn 370

Name: _____ Key _____

1. There is a pothole in the middle of the road that runs past a car front-end alignment establishment, "Big Zero Tires" (one may speculate on how the pot hole got there). The hole is located in the typical path of the left wheel of most cars. Assume that 80% of drivers are either alert enough to avoid it, or dozy enough that their car drifted out of the track and missed it.
 - a) Calculate the probability the two of the next six cars down the road will hit the pothole.

$$\begin{aligned}P[k = 2; n = 6] &= \binom{n}{k} p^k (1 - p)^{n-k} \\ &= \binom{6}{2} (0.2)^2 (0.8)^4 = 0.246\end{aligned}$$

- b) As the city develops, the small country road in front of Big Zero Tires is upgraded to a highway that typically sees 30 cars per minute pass by. The original pothole was fixed in the rebuild. However, a new hole develops near the road shoulder (naturally Big Zero Tires can't service 20% of all cars on this road, despite any other shortcomings, they aren't greedy). Assume that on average, one car every other day strays off track and hits the pothole. What is the probability that in a week, at least two cars will?

$$\begin{aligned}P[k \geq 2] &= 1 - P[k \leq 1] \\ &= 1 - (P[k=0; \lambda\tau] + P[k=1; \lambda\tau]) \\ &= 1 - \left(\frac{(0.5 \times 7)^0}{0!} e^{-(0.5 \times 7)} + \frac{(0.5 \times 7)^1}{1!} e^{-(0.5 \times 7)} \right) \\ &= 1 - (1 + 3.5)e^{-3.5} = 0.864\end{aligned}$$

