

STA 504 Homework #12

Due: Monday, December 02

Problem 1.

The total time from arrival to completion of service at a fast-food outlet, Y_1 , and the time spent waiting in line before arriving at the service window, Y_2 , with joint density function

$$f(y_1, y_2) = \begin{cases} e^{-y_1}, & 0 \leq y_2 \leq y_1 < \infty \\ 0, & \text{elsewhere.} \end{cases}$$

Another random variable of interest is $U = Y_1 - Y_2$, the time spent at the service window. Find the probability density function for U .

Problem 2.

Let v denote the volume of a three-dimensional figure. Let Y denote the number of particles observed in volume v and assume that Y has a Poisson distribution with mean λv . The particles might represent pollution particles in air, bacteria in water, or stars in the heavens. If a point is chosen at random within the volume v , then the distance R to the nearest particle has the probability density function given by

$$f(r) = \begin{cases} 4\lambda\pi r^2 e^{-(4/3)\lambda\pi r^3}, & r > 0. \\ 0, & \text{elsewhere,} \end{cases}$$

Find the density function of $U = R^3$ has an exponential distribution.