Answer to Question #75762 – Math – Statistics and Probability

Question

Verify that f(x)= x/ 8 can serve as the probability density function of a continuous random variable which can take on any value in the interval from 0 to 4.

Solution

If f(x) is a nonnegative function such that $\int_R f(x)\,dx = 1$, then there exists an absolutely continuous random variable *P* in *R* such, that f(x) is its density function.

Consequently, we have to prove that f(x) is a nonnegative function and $\int_R f(x)\,dx = 1$

1) $f(x) = \frac{x}{8}$ where x belongs to (0,4) => *f*(*x*) takes on values in the interval (0, $\frac{1}{2}$) => *f*(*x*) is a nonnegative function.

2) $\int_R f(x)\,dx = \int_0^4 \frac{x}{8}dx = \frac{x^2}{16}\Big|_{x=4} - \frac{x^2}{16}\Big|_{x=0} = \frac{16}{16} - \frac{0}{16} = 1 - 0 = 1$

We showed the fulfillment of both sufficiency conditions, hence we proved that *f*(*x*) can serve as the probability density function of a continuous random variable.