Continuous densities and probability integrals

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A sample from this topic. The complete topic collection contains three different resources and worked solutions.

Read the worked example, then show each step in the practice questions. Show the mathematical steps. A calculator, graphing tool or CAS may be used to check results where useful.

What you will practise

• Continuous random variables and probability density functions

Useful starting skills: Mathematical Methods Units 1–2 functions, algebra, probability and introductory calculus.

A probability density is non-negative and has total area 1. Probability over an interval is area under the density; the density height itself is not a probability.

For a continuous variable, an individual point has probability 0. Compute $E(X)=\int xf(x)dx$ and variance=$E(X^2)-[E(X)]^2$ over the support.

Worked example

$f(x)=kx$ on $0\leq x\leq 2$, zero otherwise. Find k.

Total area $k\int_0^2 x\,dx=2$ $k=1$.

Answer: 1/2.

Try it yourself

Name: _____ Date: _____

1. For $f(x)=2x$ on $[0, 1]$, find $P(X \leq 1/2)$.

2. For that density, find $E(X)$.

Answers and explanations

Check the method as well as the final answer. An alternative correct method is also valid.

1. 1/4.

Integrate 2 x from 0 to 1/2.

2. 2/3.

Integrate x×2 x on [0, 1].

Curriculum reference: Mathematical Methods Units 3–4 — Continuous random variables and probability density functions

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