# Interval probabilities by integration

6 questions | 14 marks

Equivalent correct methods earn the corresponding marks.

**1.** For density $2x$ on $[0, 1]$, find $P(0.3 < X < 0.9)$. [2 marks]

$0.9^2 - 0.3^2 = 0.72$.

**Answer:** 0.72.

**2.** For density $3x^2$ on $[0, 1]$, find $P(X < 0.2)$. [2 marks]

$[x^3]_0^{0.2} = 0.2^3$.

**Answer:** 0.008.

**3.** A waiting time is uniform on $[0, 12]$ minutes. Find the chance of waiting between 3 and 8 minutes. [2 marks]

The density is $\frac{1}{12}$ and the event width is 5.

**Answer:** $\frac{5}{12}$.

**4.** For density $6x(1 - x)$ on $[0, 1]$, find $P(\frac{1}{4} < X < \frac{3}{4})$. [3 marks]

Use $3x^2 - 2x^3$ as an antiderivative.

Its endpoint difference is $\frac{27}{32} - \frac{5}{32} = \frac{11}{16}$.

**Answer:** $\frac{11}{16}$.

**5.** For density $2x$ on $[0, 1]$, find $P(X > 0.6 \mid X > 0.3)$. [3 marks]

The numerator is $1 - 0.6^2 = 0.64$.

The denominator is $1 - 0.3^2 = 0.91$; divide.

**Answer:** $\frac{64}{91}$.

**6.** Explain why including either endpoint of a continuous interval does not change its probability. [2 marks]

A finite collection of singleton values adds no area.

**Answer:** Each endpoint has probability zero.