Average Value; Mean Value Theorem: Examples

1. Find the average value of the function $f(x) = \dfrac{e^{\tan x}}{\cos^2 x}$ on the interval $[0, \pi/4]$

2. Given $f(x) = \dfrac{1}{x^2}$ and the interval $[1, 4]$
   (a) Find the average value of the function
   (b) Find c such that $f_{ave} = f(c)$
   (c) Sketch the graph of f and a rectangle whose area is the same as the area under the graph of f

3. Find the number b such that the average value of $f(x) = \sqrt{x}$ on the interval $[0, b]$ is equal to 2.

4. The *lift* experienced by an airplane wing is given by the formula $L = 1/2C\rho v^2 s$, where C is a coefficient, ρ is density, v is velocity, and s is the surface area of the wing. Suppose an airplane is speeding up from a velocity of 300 km/s to 400 km/s. Find the average lift (with respect to v) for this interval.

5. The linear density of Harry Potter's 27 cm wand is $\rho(x) = 7 + 3\sqrt[3]{x}$, where x is measured in cm. Find the average density of the wand.