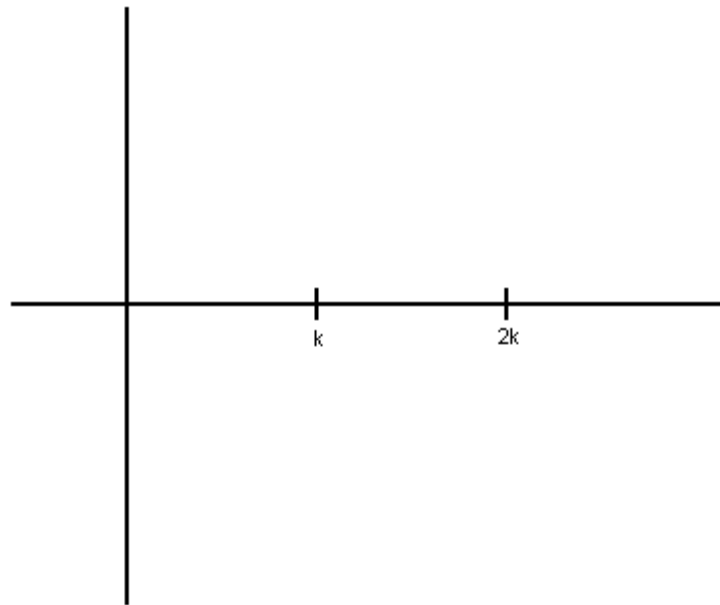


Calculus Challenge #7

Due Wednesday, January 28, 2009

1. Given the function $f(x) = \tan^{-1}\left(\frac{\sqrt{x} + \sqrt{k}}{1 - \sqrt{kx}}\right)$.
 - a) Find $f'(x)$. What effect does the value of k have on $f'(x)$?
 - b) Find $f'(k)$ and $f'(1/k)$.
 - c) For what values of x is $f'(x)$ continuous?
 - d) Use your calculator to graph $f(x)$ for several specific values of k . Then sketch a general graph on the axis below.



- e) Explain how your graph in part d) supports or contradicts your answer to c).
2. Let $H(x) = f(x) + c$ with $\int_a^b f(x) dx = \int_b^c H(x) dx$ and $\int_b^c f(x) dx = abc$.
 - a) Find $\int_a^c f(x) dx$.
 - b) Find the average value of H on $[a, c]$.