Measuring the Length of a Curve

Name:

Goal: To create a definition of the length of a curve and then use it evaluate the length of the curve $y = x^2$ for $x$ in $[0,4]$. 

1. Preliminary problem. Consider the straight line given by the function $y = f(x) = 3x + 1$.
   a. Sketch this curve.

   b. Find the length of the line segment generated when $x$ lies in the interval $[1, 3]$. Show where this segment lies on your line in (a).
2. Consider the curve \( y = f(x) = x^2 \) for \( x \) in \([0, 4]\). Make an estimate for the length of this curve by splitting the interval \([0, 4]\) into four pieces of equal length. On each of these four pieces, make an estimate for the length of the curve. Is your estimate more or less than the true length?