Math 101 – WORKSHEET 2
AREA UNDER A CURVE

(1) Let A be the area lying between the x-axis, the curve $y = x^2$ and the lines $x = 0$, $x = 1$.
   (a) Draw a picture

   (b) Dividing the interval $[0, 1]$ into two equal-width strips, show that $A \leq \frac{1}{2} \cdot \left(\frac{1}{2}\right)^2 + \frac{1}{2} \cdot 1^2 = \frac{5}{8}$.
   (c) Using the same subdivision, show that $A \geq \frac{1}{2} \cdot 0^2 + \frac{1}{2} \cdot \left(\frac{1}{2}\right)^2 = \frac{1}{8}$.

   (d) Using a subdivision into 3 strips, show $\frac{1}{3} \cdot 0^2 + \frac{1}{3}\left(\frac{1}{3}\right)^2 + \frac{1}{3}\left(\frac{2}{3}\right)^2 \leq A \leq \frac{1}{3}\left(\frac{1}{3}\right)^2 + \frac{1}{3}\left(\frac{2}{3}\right)^2 + \frac{1}{3} \cdot 1^2$.

   (e) For better accuracy, we use rectangles whose height is given by the function value at the *middle* of the strip. What do you get now?

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(2) The Σ notation:

(a) Write an expression for the sum of the sqare roots of the integers between 5 and 32.

(b) How many terms are there in this sum?

(c) Write an expression for the sum of the integers between 1 and n.

(d) Write an expression for the sum of the integers between 1 and n.