ESP Math 179 **Fall 2015**

Worksheet 23

12 November 2015

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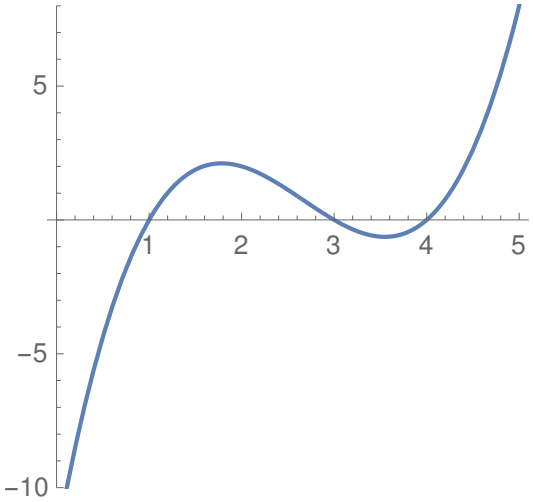
1. **Warm up:** Evaluate the following expression:

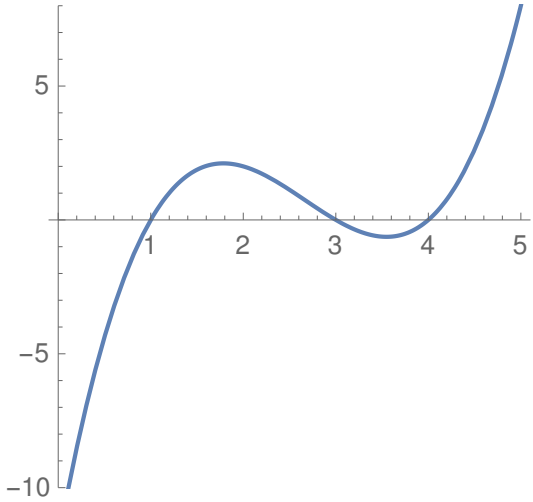
$$\frac{d}{d\theta}\left(\sin(\theta)\int \cos(\theta)\ d\theta - \cos(\theta)\int \sin(\theta)\ d\theta\right)$$

2. Consider the function $y = x^3 - 8x^2 + 19x - 12 = (x-1)(x-3)(x-4)$. Give the right Riemann sums and draw the rectangles that represent them, for the given number of intervals below, on $[0, 5]$.

   (a) 5 intervals



   (b) 10 intervals



3. Consider the function $f(x) = x^2$ and the interval $[a, b]$, for $b > a > 0$. Split the interval $[a, b]$ into n subintervals of equal length, and consider the left Riemann sum of f over $[a, b]$.

   (a) What is the width of each rectangle?

   (b) What is the height of the first rectangle in this sum?

   (c) What is the height of the kth rectangle in this sum?

   (d) What is the nth left Riemann sum of f over $[a, b]$?

   (e) What is the limit of your answer above, as $n \to \infty$?