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Worksheet week 3 - MAC 2312, Spring 2013

1. Find the area of the region bounded between the curves $x = y^2$ and $x = 2 - y$.

2. Find a function f and a number a such that

$$4 + \int_a^x \frac{f(t)}{t}\, dt = \sqrt{x} \ \text{, for all } x > 0.$$

3. The following is the so called *Fresnel sine function*, named after the French physicist Augustin Fresnel who first used this function in his study of diffraction of light waves. More recently this function has been applied to the design of highways.

$$S(x) = \int_0^x \sin(\pi t^2/2)\, dt\ .$$

The graph of this function is given in the textbook (p. 404), or it can be obtained with the wolframalpha tool (enter Fresnel sine function).

(a) Determine the positive x-coordinate of the first three relative maximum points, of the first three relative minimum points and of the first three inflection points. Use Calculus, not just the graph or wolframalpha.

(b) From the graph, it looks that the Fresnel sine function is an odd function. Can you give a rigorous argument to justify this?