

# Calculus Quiz 18

1. (5 pts) Let  $f(x) = \int_1^x \sqrt{t^2 - 1} dt$ ,  $x \geq 1$ .
- Find the arc length function  $s(x)$  for the curve  $y = f(x)$ .
  - Express the curve  $y = f(x)$  as an explicit function of arc length  $s$ . That is, find the function  $g$  such that  $y = g(s)$ .

2. (5 pts)

- a. Let  $L$  be the length of the curve  $y = f(x)$ ,  $a \leq x \leq b$ , where  $f$  is positive and has a continuous derivative. Let  $S_f$  be the surface area generated by rotating the curve about the  $x$ -axis. If  $c$  is a positive constant with  $f(x) \leq c$  on  $[a, b]$ . Let  $S$  be the surface area generated by rotating  $y = f(x)$  about the line  $y = c$ . Express  $S$  in terms of  $S_f$  and  $L$ .
- b. Find the surface area of the torus as shown in the following

