MAC2312: Calculus 2 - Section 3

Quiz 8: 8.2 Area of a Surface of Revolution — June 15, 2015

1. Set up an integral for the area of the surface obtained by rotating the curve $y = \tan x$ for $0 \le x \le \pi/3$ about the y-axis.

   A. $\displaystyle\int_0^{\pi/3} 2\pi x\sqrt{1+\sec^4 x}\; dx$

   B. $\displaystyle\int_0^{\sqrt{3}} 2\pi x\sqrt{1+\sec^4 x}\; dx$

   C. $\displaystyle\int_0^{\pi/3} 2\pi y\sqrt{\frac{2+y^2}{1+y^2}}\; dy$

   D. $\displaystyle\int_0^{\sqrt{3}} 2\pi y\sqrt{\frac{2+y^2}{1+y^2}}\; dy$

   $y = \tan x$ so $\frac{dy}{dx} = \sec^2 x$ and

$$\begin{aligned} S = \int 2\pi x\; ds &= \int_a^b 2\pi x\sqrt{1+\left(\frac{dy}{dx}\right)^2}\; dx \\ &= \int_0^{\pi/3} 2\pi x\sqrt{1+(\sec^2 x)^2}\; dx \\ &= \int_0^{\pi/3} 2\pi x\sqrt{1+\sec^4 x}\; dx. \end{aligned}$$