Math 1B Comparison theorems, Arc length Feb 21 2020

I. Comparison theorems

Determine whether each integral is convergent or divergent.

1. $\int_1^\infty \frac{x}{x^3+1}\,dx$

2. $\int_1^\infty \frac{1+\sin^2(x)}{\sqrt{x}}\,dx$

3. $\int_0^1 \frac{\sec^2(x)}{x\sqrt{x}}\,dx$

II. Arc length

Find the lengths of the described curves. (Recall: $\frac{d}{dx}\arcsin(x) = \frac{1}{\sqrt{1-x^2}}$)

1. $36y^2 = (x^2-4)^3$, $2 \leq x \leq 3$, $y \geq 0$ (Sketch the curve)

2. $x = \frac{1}{3}\sqrt{y}\,(y-3)$, $1 \leq y \leq 9$

3. $y = \ln(\sec(x))$, $0 \leq x \leq \frac{\pi}{4}$

4. $y = \sqrt{x-x^2} + \arcsin(\sqrt{x})$