## Fundamental theorem of Calculus. Computing indefinite integrals

November 28, 2016

Problems

**Problem 1.** Let  $f(x) = \int_0^x \frac{1-t^2}{3+t^4} dt$ . On which interval is the function f increasing? Where is it concave up? down?

**Problem 2.** Compute the integral  $\int \sqrt{4-x^2} dx$ . (Hint: take  $x = 2 \cos u$ .)

**Problem 3.** Compute the value of  $\int_0^{\ln 2} \sqrt{e^x - 1} dx$ .

**Problem 4.** Using **Riemann sums**, find the formula for computing the volume of a cone of height h and radius r. You can use the formula for the volume of a cylinder.

(Hint: slice the cone with horizontal planes into thin slices. Since they are so thin, you can assume they are approximately cylindrical. Then the total volume is approximately the same as the total volume of the thin cylinders. Write down this sum, realize that you need to compute some integral, and compute it with methods you have learned so far. )

