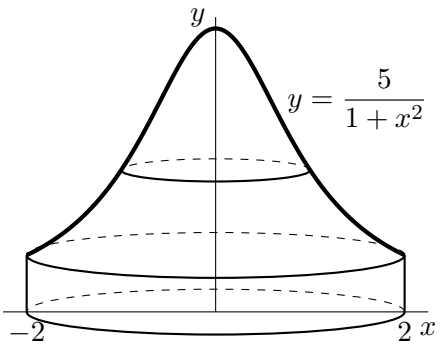
3. [12 points] A new top secret weather balloon has the ability to make it rain orange soda. The base of the balloon is a solid cylinder with a radius of 2 meters and a height of 1 meter. Above that is a solid obtained by taking the portion of the function $y = \dfrac{5}{1+x^2}$ for $0 \le x \le 2$ and rotating it around the y-axis (where x and y are measured in meters). The balloon is made of a light metal which has a constant density δ kg/m^3. The balloon is pictured on the right. (The picture is not to scale.)



a. [4 points] Write down an expression in terms of y (but not x) that approximates the volume, in cubic meters, of a horizontal slice of the weather balloon of thickness Δy at a height y meters above the ground where $1 < y < 5$.

b. [4 points] Write down an expression involving one or more integrals which gives the total mass of the weather balloon in kilograms. Do **not** evaluate any integrals in this expression.

c. [4 points] Write down an expression involving one or more integrals which gives the y–coordinate of the center of mass of the weather balloon. Do **not** evaluate any integrals in this expression.