Math 182 | Problems | Name: _____

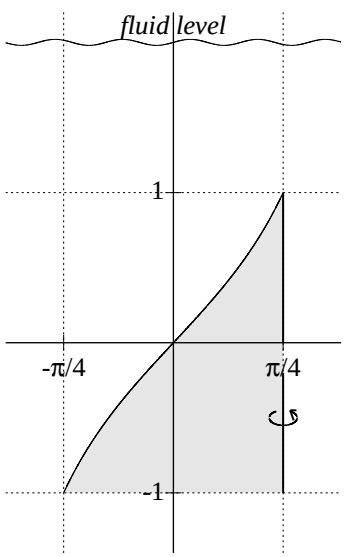
Due: 6 Mar 2018 | Section: 8.1/8.2 | Point Values in $\boxed{\text{boxes}}$.

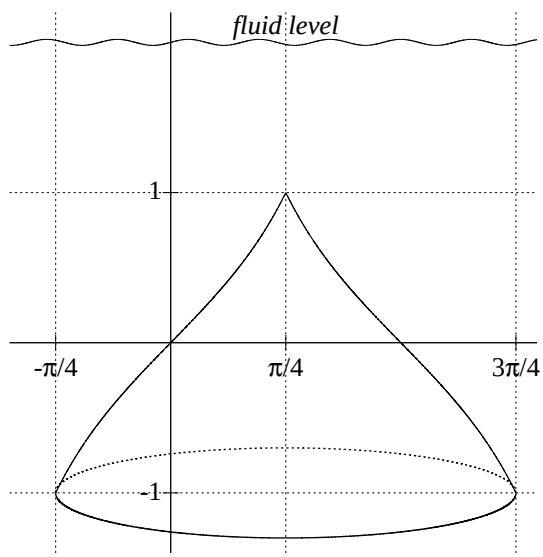
1. $\boxed{2}$ Find the length of the curve $y = \int_1^x \sqrt{\sqrt{t} - 1}\, dt$ for $0 \le x \le 16$.

2. $\boxed{2}$ Find the length of the curve $y = \sqrt{x - x^2} + \arcsin(\sqrt{x})$ on the interval on which it is defined.

3. $\boxed{2}$ Find the area of the surface obtained by rotating the curve $y = R + \sqrt{r^2 - x^2}$ for $R > r > 0$ about the x-axis.

4. $\boxed{3}$ Consider a solid that is formed by rotating the shaded region in the figure bounded by the graphs of $y = \tan x$, $y = -1$, and $x = \pi/4$, about the line $x = \pi/4$. The solid is submerged in a fluid, the surface of which is at $y = 2$. All measurements are in meters.





(a) Set up an integral to represent the fluid force acting on the 'top' of the solid, i.e. the curvy part that was generated by rotating $y = \tan x$ about the line. Do not consider the fluid force on the 'bottom' disk. Use g for the gravitational constant and ρ for the density of the fluid.

(b) The integral is a little on the ugly side. However, we live in the age of vast computing power at the touch of a fingertip. Using $g = 9.81$ m/s^2 and assuming the fluid is caramel of density $\rho = 1386$ kg/m^3, use your favorite bit of technology to estimate the integral you found in (a). To the nearest newton, your solution should look like

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5. $\boxed{1}$ Submit your neatly written solutions, in order, on paper stapled to this sheet. Do not submit scratch paper[1].

[1] Full solutions are expected, i.e. please show all necessary steps. However, do not include work that you know is incorrect, nor work that ends up not being relevant to your final solutions.