Math 222 in class problems **Week: March 29, 2021** **Name:**

1. Let C be positively oriented closed curve given by the rectangle with vertices $(0,0),(3,0),(3,4),(0,4)$. Evaluate
$$\int_C ye^x dx + 2e^x dy.$$
A: $4e^3 - 4$

2. Let C be the positively oriented closed curve given by the circle $x^2 + y^2 = 4$. Evaluate
$$\int_C y^3 dx - x^3 dy.$$
A: -24π

3. On HW #8: Fleshing out Jones 12.D
Let $S = \{(x,y) \mid a \le x \le b,\ 0 \le y \le f(x)\}$, where f is a non-negative C^1 function on $[a,b]$. Explain how the formula $A = -\int_{\partial S} y dx$ for the area of S in Folland 5.2 Example 3 (Prof Jo Slide 27) leads to the familiar formula $A = \int_a^b f(x)dx$. (Your argument should be self-contained, e.g. not require the grader to hunt through Jones' book.)

4. Jones Problem 12-4
Find the area enclosed by the curve $x^4 + y^4 = 4xy$ in the first quadrant.

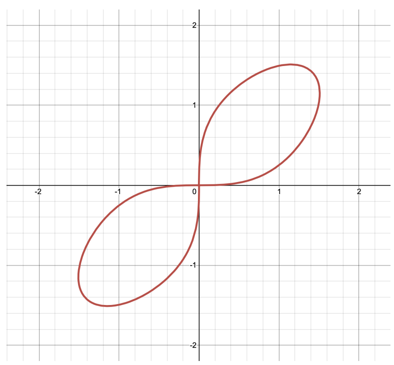

Figure 1: $x^4 + y^4 = 4xy$

5. On HW #8
Use Green's theorem as in Folland 5.2 Example 3 (Prof Jo Slide 27) to calculate the area under one arch of the cycloid described parametrically by $\mathbf{r}(t) = \langle R(t - \sin t), R(1 - \cos t)\rangle$. (Folland: $3\pi R^2$).