Math 53 Discussion Problems Nov 21

1. Use Green's Theorem to evaluate the following line integrals.

   (a) $\oint_C 3ydx + 2xdy$, where C is the boundary of the region defined by $0 \le x \le \pi, 0 \le y \le \sin x$, oriented positively

   (b) $\oint_C (6y+x)dx + (y+2x)dy$, where C is the circle $(x-2)^2 + (y-3)^2 = 4$, oriented clockwisely

   (c) $\oint_C \tan^{-1}(\frac{y}{x})dx + \ln(x^2 + y^2)dy$, where C is the boundary of the region defined in polar coordinates by $1 \le r \le 2, 0 \le \theta \le \pi$, oriented positively

2. Use Green's Theorem to find the area under an arch of the cycloid $x = t - \sin t, y = 1 - \cos t$

3. Let C be the boundary of a region R in the xy-plane, oriented positively. Show that the moment of inertia of R about the y-axis equals to $\frac{1}{4} \oint_C x^3 dy - x^2 y dx$