

Worksheet #22; date: 04/10/2018
MATH 53 Multivariable Calculus

1. *True / False?* When a curve C lies on the y -axis, then $\int_C f(x, y) dx = 0$ and $\int_C f(x, y) ds = \int_C f(0, y) dy$.
2. (*Stewart 16.2.7*) $\int_C (x + 2y) dx + x^2 dy$, where C consists of line segments from $(0, 0)$ to $(2, 1)$ and from $(2, 1)$ to $(3, 0)$.
3. (*Stewart 16.2.33*) A thin wire is bent into the shape of a semicircle $x^2 + y^2 = 4$, $x \geq 0$. If the linear density is a constant k , find the mass and center of mass of the wire.
4. (*Stewart 16.2.39*) Find the work done by the force field

$$\mathbf{F}(x, y) = x\mathbf{i} + (y + 2)\mathbf{j}$$

in moving an object along an arch of the cycloid

$$\mathbf{r}(t) = (t - \sin t)\mathbf{i} + (1 - \cos t)\mathbf{j}.$$

5. Turn in homework, it's quiz time!
6. (*Stewart 16.3.16; modified*) Do them with the definition of line integrals (or the shortcut formula with the components of \mathbf{F} . Guess a potential function (prove that this is indeed a potential function) and then use the FTL.

$$\mathbf{F}(x, y, z) = (y^2z + 2xz^2)\mathbf{i} + 2xyz\mathbf{j} + (xy^2 + 2x^2z)\mathbf{k},$$

where C is given by $x = \sqrt{t}$, $y = t + 1$, $z = t^2$, $0 \leq t \leq 1$.