Math 114. Fall 2014. HW 7. Due Nov 26 Wednesday

Instructions for written homework.

- You are encouraged to work with others on these problems. You are expected to write the solutions yourself.
- Your solutions should be legible and well organized. **Graders will deduct points for solutions that are difficult to read, or are disorganized.** For the benefit of the grader, please turn in solutions to problems in the assigned order, i.e. #1, then #2, then #3, etc.
- Staple your pages together. Do not turn in notebook paper with tattered edges. **Homework that is unstapled or is lacking a name will not be graded.**

Problem 1 (Fall 2010)**.** Find the y-coordinate of the center of mass of a thin plate in the shape of the upper half of the unit circle:

$$x^2 + y^2 = 1; \quad y \geq 0$$

if the density δ at the point (x, y) is $\delta(x, y) = x^2 + y^2$.

Problem 2 (Fall 2012)**.** A solid cylinder of height 1 and radius 1 is formed by all the points (x, y, z) such that $x^2 + y^2 \leq 1$ and $0 \leq z \leq 1$. Find the center of mass of the cylinder if its density at (x, y, z) is given by $\delta(x, y, z) = z$.

Problem 3 (Spring 2011)**.** Compute the work done by the force field

$$\vec{F} = (6xy - y^3)\vec{i} + (3y^2 + 3x^2 - 3xy^2)\vec{j}$$

along the path $\vec{r}(t) = \langle \cos(t), \sin(t) \rangle$ for $-\pi/2 \leq t \leq \pi/2$.

Problem 4 (Spring 2011)**.** Evaluate

$$\int_C xy^3 dx + 3x^2y^2 dy$$

where C is the boundary of the region in the first quadrant enclosed by the x-axis, the line $x = 1$ and the curve $y = x^3$, traveled counter-clockwise.

Problem 5 (Fall 2010)**.** Evaluate

$$\int_C x^2 dx + y^2 dy + z^2 dz$$

where C is the straight line segment from $(1, 2, 3)$ to $(2, 3, 4)$.

Problem 6 (Spring 2011)**.** Compute the line integral

$$\int_C \vec{F} \cdot d\vec{r}$$

of the vector field

$$\vec{F} = \langle 2xy^2 + 3xz^2, 2x^2y + 2y, 3x^2z - 2z \rangle$$

on the curve C given by

$$\vec{r}(t) = \langle \cos(2t) + 5\sin(5t), 6\sin(t) + 4\sin(5t), \cos(2t) + \cos(5t) \rangle$$

for $0 \leq t \leq \pi$.

Problem 7 (Fall 2011)**.** Evaluate the integral

$$\int_C (y + \sin(e^{x^2}))dx - 2xdy,$$

where C is the circle $x^2 + y^2 = 1$ traveled counter-clockwise.

Problem 8 (Spring 2010)**.** Evaluate

$$\int_C (6y + x)dx + (y + 2x)dy$$

where C is the circle

$$(x-2)^2 + (y-3)^2 = 4$$

oriented counterclockwise.

Problem 9 (Spring 2013)**.** A particle moves along the line segments from $(0, 0, 0)$ to $(1, 0, 0)$ to $(1, 5, 1)$ to $(0, 5, 1)$ and back to $(0, 0, 0)$ under the influence of the vector field

$$\vec{F}(x, y, z) = z^2\vec{i} + 3xy\vec{j} + 4y^2\vec{k}.$$

Find the work done.

Problem 10 (Spring 2013)**.** Let S be the portion of the surface $z = xy$ lying inside the cylinder $x^2 + y^2 \leq 1$. Compute the surface area of S.