

MATH 275

November 5, 2007

Names _____

1. Assume a rubber ducky is moving through the force vector field $\mathbf{F}(x, y) = -y\mathbf{i} + x\mathbf{j}$ with position vector $\mathbf{r}(t) = 2 \cos t\mathbf{i} + 2 \sin t\mathbf{j}$, over the time period $0 \leq t \leq 2\pi$. Calculate the work done on the rubber ducky.
2. Calculate the work done by the force vector field on a rubber ducky in 1. if the ducky changed its path and completes one circular path of radius 3.
3. Suppose the rubber ducky follows the same path as in 1., but now in the opposite direction. Calculate the work done on the rubber ducky.

4. Find the work done on the rubber ducky if its position is given by the vector $\mathbf{r}(t) = 2 \cos t \mathbf{i} + 2 \sin t \mathbf{j}$ for $-\pi/2 \leq t \leq \pi/2$, and it is subjected to the following force vector fields:

(a) $\mathbf{F}(x, y) = \langle y, 0 \rangle$.

(b) $\mathbf{F}(x, y) = \langle 0, x \rangle$.

5. Given the force vector field $\mathbf{F}(x, y) = \langle 1, 0 \rangle$, find the work done if a particle moves in the following three ways:

$$C_1 : \mathbf{r}(t) = \langle 0.5, t \rangle \quad 1 \leq t \leq 4$$

$$C_2 : \mathbf{r}(t) = \langle t, 1 \rangle \quad 1 \leq t \leq 3$$

$$C_3 : \mathbf{r}(t) = \langle t, 2t \rangle \quad 1 \leq t \leq 2$$