Calculus III Section 15.2 Homework

1) Find the work done by the force field $\mathbf{F}(x, y)$

on a particle as it moves along path C while subject to the force field.

Vector Field: $\mathbf{F}(x, y) = 5x^2\mathbf{i} + 3y^2\mathbf{j}$

Path C: $\mathbf{r}(t) = 2t\mathbf{i} + 6t\mathbf{j} = x(t)\mathbf{i} + y(t)\mathbf{j}$ $\quad 0 \le t \le 2$

Finding work done by force field = $\int_C \mathbf{F} \cdot d\mathbf{r}$

2) Find the work done by the force field $\mathbf{F}(x, y)$

on a particle as it moves along path C while subject to the force field.

Vector Field: $\mathbf{F}(x, y) = 5x\mathbf{i} - y^2\mathbf{j}$

Path C: $\mathbf{r}(t) = t\mathbf{i} + (t-4)\mathbf{j} = x(t)\mathbf{i} + y(t)\mathbf{j}$ $\quad 0 \le t \le 2$

Finding work done by force field = $\int_C \mathbf{F} \cdot d\mathbf{r}$

3) Find the work done by the force field $\mathbf{F}(x, y, z)$

on a particle as it moves along path C while subject to the force field.

Vector Field: $\mathbf{F}(x, y) = 3x^2\mathbf{i} - y\mathbf{j} + 3z^2\mathbf{k}$

Path C: $\mathbf{r}(t) = 4t\mathbf{i} + t\mathbf{j} + t^2\mathbf{k} = x(t)\mathbf{i} + y(t)\mathbf{j} + z(t)\mathbf{k}$ $\quad 0 \le t \le 1$

Finding work done by force field = $\int_C \mathbf{F} \cdot d\mathbf{r}$

4) Suppose a thin wire is in the shape of

the path $C:\mathbf{r}(t)=5t^2\mathbf{i}+4t\mathbf{j}=x(t)\mathbf{i}+y(t)\mathbf{j}$; $0\le t\le 4.$

The density of the wire at point (x,y) is $\rho(x,y)=2xy.$

Find the mass of the wire.

5): Suppose a thin wire is in the shape of a helix C.

$C:\mathbf{r}(t)=8\cos t\mathbf{i}+8\sin t\mathbf{j}+2t\mathbf{k}=x(t)\mathbf{i}+y(t)\mathbf{j}+z(t)\mathbf{k}$; $0\le t\le \pi/2.$

The density of the wire at point (x,y) is $\rho(x,y)=5xy.$

Find the mass of the wire.