Use the paper provided. Put your name on the front of the first page and the back of the last page. Each problem is worth 10 points. **NO CALCULATORS!**

1. Find the mass of a wire of density $\delta(x,y,z) = kz$ if it has the shape of the helix which is parameterized by $x = 3\cos t$, $y = 3\sin t$, and $z = 4t$, for $0 \le t \le \pi$.

2. Evaluate the line integral $\int_{\vec{\boldsymbol{c}}} (x^2 - y^2)\, dx + 2xy\, dy$, where $\vec{\boldsymbol{c}}(t) = (t^2, t^3)$ for $0 \le t \le 1$.

3. Find the work done by the force field $\vec{\boldsymbol{F}}(x,y) = (x^3 - y^3)\,\vec{\boldsymbol{i}} + xy^2\,\vec{\boldsymbol{j}}$ as it moves a particle along $\vec{\boldsymbol{c}}(t) = (t^2, t^3)$ for $-1 \le t \le 0$.

4. Calculate $\int_{\vec{\boldsymbol{c}}} y\, dx + x^2\, dy$, where $\vec{\boldsymbol{c}}$ is the right angle curve from $(0,-1)$ to $(4,-1)$ to $(4,3)$.

5. Find the work done by the force field

$$\vec{\boldsymbol{F}}(x,y) = -K\frac{x\,\vec{\boldsymbol{i}} + y\,\vec{\boldsymbol{j}} + z\,\vec{\boldsymbol{k}}}{(x^2+y^2+z^2)^{3/2}} = \vec{\nabla}\left(\frac{K}{\sqrt{x^2+y^2+z^2}}\right)$$

as it moves a particle along the straight line curve from $(0,3,0)$ to $(4,3,0)$.