MATH275-002
Eleventh Written Assignment
Due at Class Time
Monday, 15 November

(1) Evaluate
$$\int_C \mathbf{F}(x,y)\cdot d\mathbf{r}$$
where $\mathbf{F}(x,y) = (x+y)\mathbf{i} + (y^2 - x)\mathbf{j}$ and C is the path that starts at $(-1,0)$, goes along the x-axis to $(1,0)$ and returns to $(-1,0)$ along the upper part of the unit circle $x^2 + y^2 = 1$

(2) Determine if $\mathbf{F}(x,y) = 2xy\sinh(x^2y)\mathbf{i} + x^2\sinh(x^2y)\mathbf{j}$ is a gradient, then calculate the line integral
$$\int_C \mathbf{F}(x,y)\cdot d\mathbf{r}$$
where $\mathbf{r}(t) = a\cos(t)\mathbf{i} + b\sin(t)\mathbf{j}$ for $0 \le t \le 2\pi$

(3) A wire in the shape of the quarter circle
$$C : \mathbf{r}(t) = a(\cos(t)\mathbf{i} + \sin(t)\mathbf{j}),\ \ 0 \le t \le \frac{\pi}{2}$$
has varying mass density given by $\lambda(x,y) = k(x+y)$ where k is a positive constant. Find the total mass of the wire and give the coordinates of the center of mass.

(4) What is the value of
$$\int_C y^2dx + (xy - x^2)dy$$
if C is the path from $(0,0)$ to $(2,4)$ along the path $y^2 = 8x$?

(5) Let C be the curve traced by $\mathbf{r}(u) = u\mathbf{i} + u^2\mathbf{j} + u^2\mathbf{k}$ for $0 \le u \le 1$. Find the value of
$$\int_C yz\,dx + x^2\,dy + xz\,dz$$