Calc 3 - Assignment 16 (Line Integrals)

(1) Evaluate the line integrals for the given curve C:

a) $\int_C y^3\,ds$, $C: x=t^3, y=t,\ t\in[0,2]$

b) $\int_C x\sin(y)\,ds$, C is the line segment from $(0,3]$ to $(4,6]$

c) $\int_C xe^y\,dx$, C is the curve $x=e^y$ from $(1,0]$ to $(e,1]$

d) $\int_C xy\,dx + (y-x)\,dy$, C consists of the line segments from $(0,0]$ to $[2,0]$ and from $(2,0]$ to $[3,2]$

e) $\int_C \sin(x)\,dx + \cos(y)\,dy$, C is top-half of the circle $x^2+y^2=1$ from $(1,0)$ to $(-1,0]$.

f) $\int y\,dx + z\,dy + x\,dz$, C given by $r(t) = \langle t^2, 2t+1, 4t\rangle,\ t\in[0,1]$

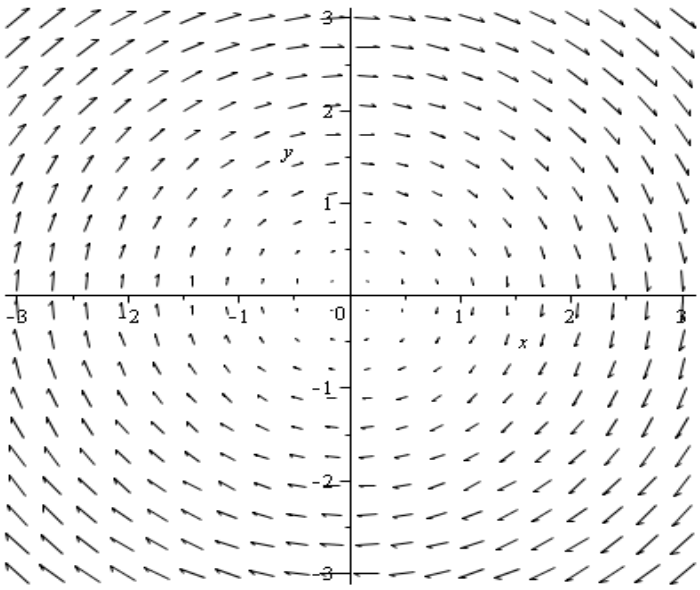
② Evaluate $\int_C \vec{F} \cdot d\vec{r}$ for the given curve $r(t)$.

a) $\vec{F} = (xy, 3y^2)$, $r(t) = \langle t^4, t^3 \rangle$, $t \in [0,1]$

b) $\vec{F} = \langle x+y, y-z, z^2 \rangle$, $r(t) = \langle t^2, t^3, t^2 \rangle$, $t \in [0,1]$

c) $\vec{F} = \langle z, y, -x \rangle$, $r(t) = \langle t, \sin(t), \cos(t) \rangle$, $t \in [0, \pi]$

③ Let $\vec{F}$ be the vector field shown in the figure below. Let C_1 be the line segment from $(-3,-3)$ to $(-1,3)$, and C_2 a circle with radius 3 and center at the origin. Are $\int_{C_1} \vec{F} \cdot d\vec{r}$ and $\int_{C_2} \vec{F} \cdot d\vec{r}$ positive, negative, or zero?



The vector field $\langle y, -x \rangle$