MATH 234 QUIZ 9 1 DEC 2016, TA: JIUYA WANG

Name:

Notice:
1. Please box your final answer.
2. Please stop writing when time is up.

Problem 1 (10 points):
Given $\vec{F} = \begin{pmatrix} x^2 - 2xy^3 \\ -3x^2y^2 \end{pmatrix}$, and the curve $C : \vec{\gamma}(t) = \begin{pmatrix} t^2 - t \\ \sin \pi t \end{pmatrix}$
1. Is $\vec{F}$ conservative or not?
2. Consider the line integral of $\vec{F}$ over γ from $t = 0$ to $t = 1$

1. Yes. $Q_x = -6xy^2 = P_y = 0 - 6xy^2 = -6xy^2$

2. $\vec{\gamma}(0) = \begin{pmatrix} 0 \\ 0 \end{pmatrix}$ $\vec{\gamma}(1) = \begin{pmatrix} 0 \\ 0 \end{pmatrix}$ $\vec{F}$ is conservative.

So $\oint_{\vec{\gamma}} \vec{F} \cdot d\vec{s} = 0$

Problem 2 (10 points):
Find the average x coordinates of the quarter of the unit circle that lies in the first quadrant($x \leq 0, y \leq 0$). $\vec{\gamma}(t) = \begin{pmatrix} \cos t \\ \sin t \end{pmatrix}$ $0 \leq t \leq \frac{\pi}{2}$

Arc Length: $\int_0^{\frac{\pi}{2}} \|\vec{\gamma}'(t)\| \, dt = \frac{\pi}{2}$

x coordinates: $\int_0^{\frac{\pi}{2}} \cos t \cdot \|\vec{\gamma}'(t)\| dt = \sin t \Big|_0^{\frac{\pi}{2}} = 1$

Ave: $\frac{1}{\pi/2} = \frac{2}{\pi}$