HW 45

① Use the cross-partials property to decide which of the following vector fields might be gradients everywhere on their respective domains and which are definitely not.

$\vec{A} = \langle \cos(xy), \cos(xy) \rangle$

$\vec{B} = \langle y\cos(xy), x\cos(xy) \rangle$

$\vec{C} = \langle x\cos(xy), y\cos(xy) \rangle$

$\vec{D} = \langle 4x^3y - 3x^2y^2, x^4 - 2x^3y \rangle$

$\vec{E} = \langle 4x^3y - 3x^2y^2, 6x^2y^2 - 2xy^3 \rangle$

② Find $\int_I \vec{F} \cdot d\vec{r}$ where $\vec{F} = \langle x^{-1}, y^{-2} \rangle$ and I is the path $\vec{r} = \langle \sqrt{1+t^3}, \sqrt{t^5+1} \rangle$ from $t=0$ to 1.

③ Given $\vec{F}$ as above, find $\int_J \vec{F} \cdot d\vec{r}$ where J is the triangular path from (1,2) to (4,4) to (5,7) to (1,2).