Quiz 5 Calculus 3 11/14/11

Each problem is worth 5 points. Clear and complete justification is required for full credit.

1. Compute $\int_C \langle 9x^2y^4+2-y, 12x^3y^3-x\rangle \cdot d\vec{r}$, where C is the top half of a circle with radius 3, traversed counterclockwise. $3x^3y^4+2x-yx$ $f_y = 12x^3y^3 - x$

$3x^3y^4+2x-yx$ is a potential function

$$\int_c \vec{F}\cdot d\vec{r} = 3x^3y^4+2x-yx\Big|_{(3,0)}^{(-3,0)} = \left[3(-3)^3(0)^4+2(-3)-(0)(-3)\right]-\left[3(3)^3(0)^4+2(3)-(0)(3)\right]$$

$$= 0-6+0-0-6-0 = -6-6 = \boxed{-12}$$

Great!

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2. Compute $\int_C \langle 4x+1, x-y\rangle \cdot d\vec{r}$ for a line segment beginning at (3, 0) and ending at (1, 2).

parameterization = $\vec{r} = \langle 3-2t, 2t\rangle$ $0 \le t \le 1$

$\vec{F}(\vec{r}(t)) = \langle 13-8t, 3-4t\rangle$

$\vec{r}\,'(t) = \langle -2, 2\rangle$

$\int_0^1 \langle 13-8t, 3-4t\rangle \cdot \langle -2, 2\rangle \, dt$

$= \int_0^1 16t-26+6-8t\, dt = \int_0^1 8t-20\, dt$

$= \left[4t^2-20t\right]_0^1 = -16$

Well done!