Assignment 2

1- Evaluate

$$\int_C (2yx^2 - 4x)\, dr$$

Where C is lower half of the circle centered at the origin of radius 3 with clockwise rotation.

2- Evaluate $\int_C \vec{F} \cdot d\vec{r}$, where $\vec{F} = \langle y, 3y^3 - x, z \rangle$ and the path C is defined by $C(t) = \langle t, t^n, 0 \rangle, 0 \leq t \leq 1 \; where \; n = 1,2,3,..$

3- Evaluate $\int_C \vec{F} \cdot d\vec{r}$, where $\vec{F} = \langle xy, 1 + 3y, 0 \rangle$ and C is the line segment from $(0, -4)$ to $(-2, -4)$ followed by portion of $y = -x^2$ from $x = -2$ to $x = 2$ which is in turn followed by the line segment from $(2, -4)$ to (5,1).

4- Evaluate $\iint_S 2y \, dS$ where S is the portion $y^2 + z^2 = 4$ between $x = 0$ and $x = 3 - z$.

5- Let the temperature of a point in space be given by $T(x, y, z) = 3x^2 + 3z^2$. Compute the heat flux across the surface $x^2 + z^2 = 2, 0 \leq y \leq 2, \; if \; k = 1$. (Give a physical explanation to justify the sign of your result?)

6- Evaluate $\iint_S \vec{F} \cdot dS$ where $\vec{F} = y\hat{\imath} + 2x\hat{\jmath} + (z - 8)\hat{k}$ and S is the surface of the solid bounded by $4x + 2y + z = 8, z = 0, y = 0 \; and \; x = 0$ with the positive orientation. Note that all four surfaces of the solid are included in S.