1. Evaluate $\oint_C (x - y)dx + xdy$ once around the unit circle $C$: $x^2 + y^2 = 1$

2. Determine the work done, $\int_C \mathbf{F} \cdot d\mathbf{r}$, for on a particle subject to the force $\mathbf{F}(x,y) = 9x^2y^2\mathbf{i} + (6x^3y - 1)\mathbf{j}$ while traveling along a line segment from $P(0,0)$ to $Q(5,9)$.

3. Evaluate $\int_C xydy - y^2dx$ where $C$ is the square cut from the first quadrant by the lines $x = 1$ and $y = 1$.

4. Find the flux, $\iint_S \mathbf{F} \cdot \mathbf{N} \, dS$ for $\mathbf{F} = xy\mathbf{i} + yz\mathbf{j} + xz\mathbf{k}$ outward through the surface of the cube cut from the first octant by the planes $x = 1$, $y = 1$ and $z = 1$.

5. Use Stokes’ Theorem to evaluate $\iint_S \text{curl} \mathbf{F} \cdot \mathbf{N} \, dS$ for $\mathbf{F} = 2y\mathbf{i} + 3xz\mathbf{j} - z^2\mathbf{k}$ and $S$ is the portion of the hemisphere $x^2 + y^2 + z^2 = 9$ above the $xy$–plane.

6. Find the flux, $\iint_S \mathbf{F} \cdot \mathbf{N} \, dS$ for $\mathbf{F} = x\mathbf{i} + y\mathbf{j} + z\mathbf{k}$ outward through the surface of the unit sphere $x^2 + y^2 + z^2 = 1$. 

(*Material since the last exam)