MTH 265, Quiz #15, Summer 2024 Name ____

Instructions: Show all work. Use exact answers unless otherwise asked to round.

1. Evaluate $\int_C \vec{F} \cdot d\vec{r}$ for $\vec{F}(x, y, z) = -y\hat{\imath} + x\hat{\jmath} - 2\hat{k}$ for the boundary of the surface $S: z^2 = x^2 + y^2, 0 \le z \le 4$, oriented downward, using Stokes' Theorem.

2. Evaluate the flux $\iint_S \vec{F} \cdot d\vec{S}$ for $\vec{F}(x, y, z) = (\cos z + xy^2)\hat{\imath} + xe^{-z}\hat{\jmath} + (\sin y + x^2 z)\hat{k}$, where S is the surface of the solid bounded by the paraboloid $z = x^2 + y^2$ and the plane $z = 4$.

3. Evaluate $\int_C \vec{F} \cdot d\vec{r}$ for $\vec{F}(x, y, z) = -2yz\hat{\imath} + y\hat{\jmath} + 3x\hat{k}$ for the boundary of the surface $S: z = 5 - x^2 - y^2, z \geq 1$, oriented upward, using Stokes' Theorem.

4. Evaluate the flux $\iint_S \vec{F} \cdot d\vec{S}$ for $\vec{F}(x, y, z) = x^2\hat{\imath} + xy\hat{\jmath} + z\hat{k}$, where S is the surface of the solid bounded by the paraboloid $z = 4 - x^2 - y^2$ and the xy-plane using the Divergence Theorem.