Sections 17.4, 17.5

Name: _____

Math 1920 - Andres Fernandez

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Problems

(1) Compute the integral $\int\int_{\mathcal{S}} x^2 y \, dS$, where $\mathcal{S}$ is the surface given by $z = \sqrt{3}x + y^2$, $-1 \leq x \leq 1$, and $0 \leq y \leq 1$.

(2) Calculate $\int\int_{\mathcal{S}} (x^2 + y^2) e^{-z} \, dS$, where S is the cylinder given by $x^2 + y^2 = 9$ and $0 \leq z \leq 10$.

(3) Compute flux of the vector field $\mathbf{F} = \langle x, y, z \rangle$ through the part of the unit sphere with $0 \leq z \leq \frac{\sqrt{3}}{2}$ with normal pointing outwards.

(4) Calculate the flow rate of a fluid with velocity vector field $\mathbf{v} = \langle 2x, y, xy \rangle$ across the part of the cylinder $x^2 + y^2 = 9$ where $x, y \geq 0$ and $0 \leq z \leq 4$.

(5) Suppose that you submerge a closed surface (for example a sphere) into the ocean. What is the net flux of water through the surface?

Now you can answer the following question without a single computation: find the flux of the constant vector field $\langle 2, 3, 6 \rangle$ along the unit sphere centered at (3,1,5).

(6) Calculate the flow rate of a fluid with velocity vector field $\mathbf{v} = \langle 2x, y, xy \rangle$ across the part of the cylinder $x^2 + y^2 = 9$ where $x, y \geq 0$ and $0 \leq z \leq 4$.

(7) Determine the flow for the vector field $\mathbf{v} = \langle x - y, z + y + 4, z^2 \rangle$ through the surface given by $y = 1 - x^2 - z^2$ and $y \geq 0$ oriented in the positive y direction.