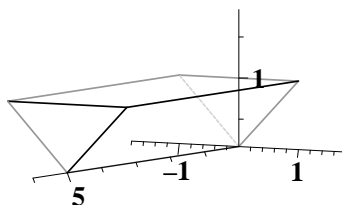


Recorder: _____

Task Master: _____ Cynic: _____ Other: _____

THE FISHING NET

Working in small groups (3 or 4 people), solve as many of the problems below as possible. Try to resolve questions within the group before asking for help. The Recorder is responsible for writing up the group's results and turning it in. Show your work! Full credit will only be given if your answer is supported by calculations and/or explanations as appropriate.



1. A fishing net S is in the shape of a triangular trough, as shown in the picture. The triangular sides are at $x = 0$ and $x = 5$, the rectangular sides are at 45° to the vertical, and the bottom is at $z = 0$; all lengths are measured in cm. The net is open at the top, which is at $z = 1$. Water is draining out of the net; the motion of the water is described by the vector field

$$\vec{F} = \rho \left(a e^{\kappa z^2} \hat{j} - b \hat{k} \right)$$

where $a = 3 \frac{\text{cm}}{\text{s}}$, $b = 5 \frac{\text{cm}}{\text{s}}$, $\kappa = 2 \text{ cm}^{-2}$, and ρ is the (constant) density of the water in $\frac{\text{g}}{\text{cm}^3}$. The goal of this problem is to find the best way to evaluate the flux

$$\iint_S \vec{F} \cdot d\vec{A}$$

of water *down* through S .

- (a) Set up the above surface integral, **but do not evaluate it**. Your answer should be ready to integrate; among other things, all substitutions should be made, and you should determine the correct limits.
- (b) **Use the Divergence Theorem** to find another way to do the problem. This time, complete the computation.