

PHYS301

HOMEWORK #3

Due : Monday, 13 Feb. 2012

1. Verify the divergence theorem for the function :

$$\mathbf{v} = (x y) \hat{\mathbf{x}} + (2 y z) \hat{\mathbf{y}} + (3 z x) \hat{\mathbf{z}}$$

for the volume defined by the cube of length 2 in the first octant (meaning one vertex is at (0, 0, 0) and the other is at (2, 2, 2)).

2. Verify Stokes' Theorem for the function :

$$\mathbf{v} = a y \hat{\mathbf{x}} + b x \hat{\mathbf{y}}$$

over the circle of radius R centered at the origin, and a and b are constants.

3. Compute the line integral of :

$$\mathbf{v} = 6 \hat{\mathbf{x}} + y z^2 \hat{\mathbf{y}} + (3 y + z) \hat{\mathbf{z}}$$

over the triangular path defined by the line segments (0, 0, 2) → (0, 0, 0) → (0, 1, 0) → (0, 0, 2).

4. Write three short Mathematica programs showing how to compute the value of 10! using a Do loop, For statement and While statement