Integrating Differential Forms over Subsets of $\mathbb{R}^3$-HW Problems

Evaluate.

1. $\int_c \omega$; $\omega = xyzdx + yzdy + zdz,$

   $\vec{c}(t) =< t,\ t^2,\ t^3 >,\ \ 0 \le t \le 1$

2. $\int_c f\omega$; $\omega = (x^2 + y^2 + z^2)dx + xydy + yzdz,$

   $f(x, y, z) = y$

   $\vec{c}(t) =< 1,\ t,\ t^3 >,\ \ 0 \le t \le 1$

3. $\iint_S \eta$; $\eta = xydxdy$

   S is the portion of the sphere $x^2+y^2 + z^2 = 1,$

   and $x \ge 0.\ y \ge 0,\ z \ge 0.$

4. $\iint_S \eta$; $\eta = y^2dxdy + xdydz$

   S is the portion of the cone $\vec{\Phi}(r, \theta) =< rcos(\theta), rsin(\theta), r >;$

   $0 \le r \le 2,\ \ 0 \le \theta \le 2\pi.$

5. $\iiint_W \varphi$; $\varphi = (x^2 + y^2 + z)dxdydz$

   $W = [0,1] \times [0,3] \times [1,2].$