In[1]:=
```
(* We compute the surface area of the upper
 hemisphere with radius R centered at the origin *)
r = {R Sin[ph] Cos[th], R Sin[ph] Sin[th], R Cos[ph]};
rt = D[r, th];
rp = D[r, ph];
n = Simplify[Cross[rt, rp]]
nn = Simplify[Norm[n], Assumptions -> R > 0 && 0 < th < 2 Pi && 0 < ph < Pi / 2]
Integrate[Integrate[nn, {th, 0, 2 Pi}], {ph, 0, Pi / 2}]
```

Out[4]= $\left\{-R^2 \text{Cos}[\text{th}]\ \text{Sin}[\text{ph}]^2,\ -R^2\ \text{Sin}[\text{ph}]^2\ \text{Sin}[\text{th}],\ -R^2\ \text{Cos}[\text{ph}]\ \text{Sin}[\text{ph}]\right\}$

Out[5]= $R^2\ \text{Sin}[\text{ph}]$

Out[6]= $2\ \pi\ R^2$