1. Find $\lim_{(x,y)\to(0,0)} \frac{4xy^2}{x^2+y^2}$, if it exists.

2. Find the Largest and the smallest value of $f(x,y) = 2xy$ on the ellipse $x^2/16+y^2/4 = 1$.

3. Suppose that f and g are scalar functions with continuous first and second order partial derivatives throughout a region D that is bounded by a closed piecewise smooth surface ∂D.

   (a) Show that
   $$\iint_{\partial D} f\nabla g \cdot \mathbf{n} d\sigma = \iiint_D (f\nabla^2 g + \nabla f \cdot \nabla g) dV$$

   (b) show that
   $$\iint_{\partial D} (f\nabla g - g\nabla f) \cdot \mathbf{n} d\sigma = \iiint_D (f\nabla^2 g - g\nabla^2 f) dV$$