Math 226, HW4, Due on Friday, October 6

1. Section 12.3: 7, 9, 11, 12, 22, 34
2. Section 12.4: 4, 5, 16
3. Sketch each of the following sets $D$ and identify its boundary $\partial D$. No proof is required.
   (a) \[ \{(x, y) \in \mathbb{R}^2 : x^2 + y^2 > 1\} \]
   (b) \[ \{(x, y) \in \mathbb{R}^2 : x^2 + y^2 \geq 1\} \]
   (c) \[ \{(x, y) \in \mathbb{R}^2 : x^2 + y^2 \leq 1\} \cup \{(x, y) \in \mathbb{R}^2 : (x-2)^2 + y^2 \leq 1\} \]
   (d) \[ \{(x, y) \in \mathbb{R}^2 : x > 0, y = \sin(1/x)\} \]
4. For each of the following, find the limit and prove, using the $\epsilon$-$\delta$ definition, that the limit exists.
   (a) \[ \lim_{(x,y)\rightarrow(1,2)} x^2 y^2 \]
   (b) \[ \lim_{(x,y)\rightarrow(0,0)} \frac{1}{x^2+y^2+1} \]
   (c) \[ \lim_{(x,y)\rightarrow(0,0)} \frac{x^3 y^2}{x^4+y^4} \]