1. [10 points] Find the absolute maximum and the absolute minimum of the function $f(x) = \dfrac{x}{x^2 + 1}$ on the interval $[-3, 3]$.

2. By taking the natural logarithm if necessary and using the l'Hospital's Rule evaluate the limits

(a) [10 points] $\displaystyle \lim_{x \to 0} \frac{\cos^2 x - 1}{3x^2}$

(b) [10 points] $\displaystyle\lim_{x \to 0} x^{\sqrt{x}}$

3. [10 points] A rectangular box with a square base and no top is to have a volume of 4 cubic inches. Find the dimensions for the box that require the least amount of material.