1. (5 points) Find the following limit:
\[
\lim_{x \to 0} (1 + 2x)^{\frac{1}{x}}
\]
\[
\lim_{x \to 0} \frac{1}{x} \ln(1 + 2x) = \lim_{x \to 0} \frac{1}{1 + 2x} \cdot 2 = 2
\]

2. (5 points) You are asked to construct a cylinder with a fixed volume \( V \) and minimal surface area. What is the ratio of the height of your cylinder to its radius? \( V = \pi r^2 h, \quad SA = 2\pi r^2 + 2\pi rh \)

\[
V = \pi r^2 h \quad h = \frac{V}{\pi r^2}
\]

\[
SA = f(r) = 2\pi r^2 + 2\pi r \left( \frac{V}{\pi r^2} \right) = 2\pi r^2 + \frac{2V}{r}
\]

\[
f'(r) = 4\pi r - \frac{2V}{r^2} \quad f'(r) = 0 \quad \Rightarrow \quad 4\pi r = \frac{2V}{r^2}
\]

\[
r = \sqrt[3]{\frac{V}{2\pi}} = \sqrt[3]{\frac{V}{2\pi}} \quad h = \sqrt[3]{\frac{V}{2\pi}} \cdot \frac{2}{3} \quad h = \frac{V}{\pi} \cdot \frac{2}{3}
\]

\[
h = 2r
\]