1. Sketch the graphs of the following two functions.

(a) \( f(x) = x(6-2x)^2 \) \( x \leq 0 \) \( x = 3 \)
\[ f'(x) = (6-2x)^2 + x(2)(6-2x)(-2) \]
\[ = (6-2x)^2 - 4x - 4x \]
\[ = (6-2x)^2 - 4x \]
\[ f''(x) = (6-2x)(-6) + (6-6x)(-2) \]
\[ = -36 + 12x \]
\[ f(1) = 1(4)^2 = 16 ; f'(2) = 2(2) = 8 \]

(b) \( f(x) = x^4 - 2x^2 = x^2(x^2 - 2) \)
\[ x = \sqrt{2} \text{ or } x = -\sqrt{2} \]
\[ f'(x) = 4x^3 - 4x = 4x(x^2 - 1) \]
\[ f''(x) = 12x^2 - 4, \text{ min } f'' \text{ at } x = \frac{\sqrt{3}}{3} \]

2. A rectangular plot of farmland will be bounded on one side by a river and on the other three sides by a single strand electric fence. With 800 m of wire at your disposal, what is the largest area you can enclose, and what are its dimensions?

\[ 2x + y = 800 \]
\[ y = 800 - 2x \]
\[ A = xy \]
\[ A = x(800 - 2x) \]
\[ A = 800x - 2x^2 \]
\[ A' = 800 - 4x \]
\[ A'' = -4 \]
\[ x = 200 \text{, } y = 400 \]
\[ A = 80,000 \text{ m}^2 \]