4.

4. Since the fences enclose a rectangular plot without one side, two sides have length b and one side has length a:

$a+b+b=3973 \implies a=3973-2b$

the area:

$\text{area}=a\times b=(l-2b)\,b=\ 3973\,b-2\,b^2$

Note that the formula is for parabola. Now find the vertex:

$\text{vertex}=\ (\frac{3973}{4}\ \text{yd}\ ,\ \frac{15\,784\,729}{8}\ \text{yd}^2\ )$

Square the unit for vertex's vertical coordinate since it is a quadratic.