4.

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

$a + b + b = 3494 \implies a = 3494 - 2b$

the area:

$area = a \times b = (l - 2b)\, b = 3494\, b - 2\, b^2$

Note that the function is for parabola. Now compute the vertex:

$vertex = (\frac{1747}{2} \text{ yd} , \frac{3\,052\,009}{2} \text{ yd}^2)$

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