Solution to "Practice Test" Fall 2004

1. \( x \)

\[ A = xy \]

**Subject to**

\[ 2x + y = 300 \]

**Maximize Area**

\[ A = xy \]

Use constraint to eliminate one variable from \( A(x,y) = xy \)

\[ y = 300 - 2x \]

\[ A = x(300-2x) = 300x - 2x^2 \]

**New Equivalent problem**

\[ \frac{\partial A}{\partial x} = 300 - 4x = 0 \]

\[ x_c = \frac{300}{4} = 75 \text{ m} \]

Use 2nd derivative test to check if \( x_c \) gives max area

\[ A'(x) = -4 \]

\[ A''(75) = -4 \]

\[ \text{Gives max area} \]

\[ y = 300 - 2(75) = 150 \text{ m} \]

\[ x = 75 \text{ m} \text{ and } y = 150 \text{ m} \text{ give largest swimming area} \]

\[ \text{with } 300 \text{ m of rope} \]

**Maximum Area**

\[ (75 \text{ m})(150 \text{ m}) = 11,250 \text{ m}^2 \]