1 5.5: Applied Max/Min Problems

**Goal:** To optimize a practical value subject to certain restrictions (often given geometrically)

**Examples:**

A closed rectangular storage container with a square base is to have a volume of 2250 \( \text{cm}^3 \). Material for the top and bottom cost $0.20 per square centimeter. Material for the sides costs $0.30 per square centimeter. Find the cost of materials for the cheapest such container.

A poster is to have an area of 150 square inches with 1-inch margins at the sides and bottom and a 2-inch margin at the top. What dimensions will give the largest printed area?
A wire 40cm long is to be cut into at most 2 pieces. The first piece is bent into a square; the second piece is bent into a circle. How should the wire be divided in order to maximize the total area?

Find the shortest distance from the point (3, 7) to the line $y = 2x$. 

2
On Your Own:

Suppose 40\pi square feet of material are available to make a cylindrical can. Find the radius and height of the cylinder with the largest possible volume. (HINT: The lateral area of a cylinder is \( A = 2\pi rh \). Don’t forget to include the top and bottom area as well!)

\[
\text{radius} = \sqrt{\frac{20}{3}} \text{ ft}; \; \text{height} = 2\sqrt{\frac{20}{3}} \text{ ft}.
\]