

1. A positive number cubed added to another positive number is 256. Find the maximum product of two such numbers.
2. Find the the point on the graph of

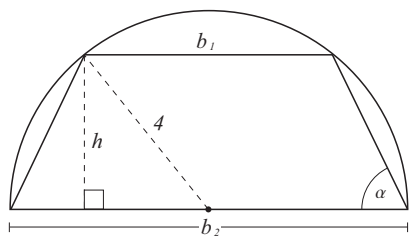
$$f(x) = \sqrt{x - 3}$$

that is closest to the point $(4, 0)$.

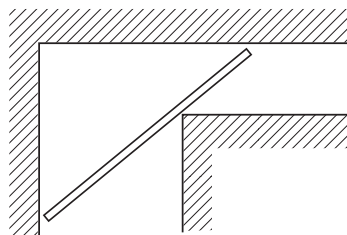
3. An open top box is to be made from a 12-inch by 15-inch sheet of cardboard, by cutting squares from each corner and folding up the sides. Find the length of the side of the square that will give the box the largest possible volume.



4. A cylindrical container must have a volume of 375 cubic feet. The material for bottom costs twice as much as the material for the sides and the lid. Find the dimensions of the container that will minimize cost.
5. An isosceles trapezoid is inscribed in a semi-circle of radius 4 inches. Find the height of the trapezoid that would give it the largest possible area. What is the measure of the base angle α of this trapezoid?



6. A pipe of negligible diameter is to be carried horizontally around a corner from a hallway that is 8 feet wide to a hallway that is 4 feet wide. What is the maximum length the pipe can have?



Optimization Answers

1. 768

2. $\left(\frac{7}{2}, \frac{\sqrt{2}}{2}\right)$

3. $\frac{9 - \sqrt{21}}{2}$ inches

4. $r = \frac{5}{\sqrt[3]{\pi}}$ ft, $h = \frac{15}{\sqrt[3]{\pi}}$ ft

5. $h = 2\sqrt{3}$, $\alpha = 60^\circ$

6. $4(2^{2/3} + 1)^{3/2}$ ft