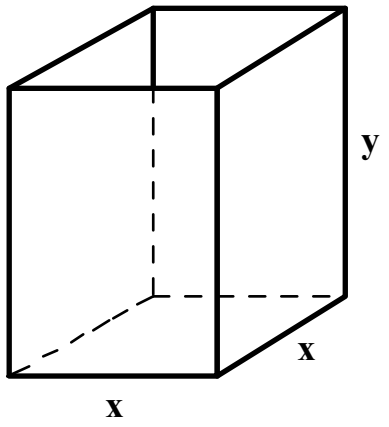
Calculus Worksheet #6 Unit 2 page 1 Selected Solutions

Solve the following problems. Show your work neatly organized in the space provided. Express irrational solutions rounded to three significant digits.

1. A rectangular box with a square base is to have a capacity of 100 cubic feet. If the material for the top costs \$1.40 per square foot, the material for the sides cost \$2.50 per square foot, and the material for the bottom costs \$2.60 per square foot, then what dimensions will minimize the total cost of the materials?



	area sq. ft.	cost dollars
sides	$4xy$	$10xy$
top	x^2	$1.4x^2$
bottom	x^2	$2.6x^2$

Total cost = $C = 4x^2 + 10xy$

$x^2y = 100 \longrightarrow y = \frac{100}{x^2}$

$C = f(x) = 4x^2 + 1000x^{-1}$

$f'(x) = 8x - 1000x^{-2}$

$8x - 1000x^{-2} = 0$

$8x^3 = 1000$

$x = 5$

$y = 4$

Note

$f''(x) = 8x + 2000x^{-3}$

$f''(5) > 0$

Therefore, f(5) is a minimum cost.

The box should be 5 feet wide, 5 feet long, and 4 feet tall.