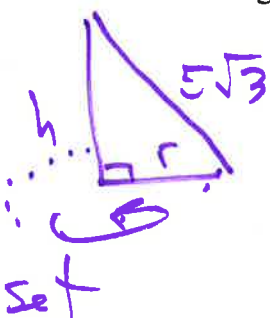


6pts You must use Calculus to solve the problems. No guess and check.

1. A right triangle with hypotenuse of  $5\sqrt{3}$  inches is revolved about one of its legs to generate a cone. What is volume of the cone of the greatest possible volume?



$$h^2 + r^2 = (5\sqrt{3})^2 = 75$$

$$V_{\text{cone}} = \frac{1}{3} \pi r^2 h = \frac{1}{3} \pi (75 - h^2) \cdot h = \frac{1}{3} \pi [75h - h^3]$$

$$V'(h) = 0 = \frac{1}{3} \pi [75 - 3h^2] \rightarrow 75 - 3h^2 = 0$$

$$5^2 + r^2 = 75$$

$$r^2 = 50 \rightarrow r = \sqrt{50} = 5\sqrt{2}$$

$$75 = 3h^2$$

$$h^2 = 25$$

$\rightarrow h = 5$   
throw -5 away.

$$\text{So } V_{\text{max}} = \frac{1}{3} \pi (50)(5) = \frac{250\pi}{3}$$

2. The sum of two numbers is 10. The sum of their cubes is a minimum. What are the two numbers?

$$x + y = 10 \quad x^3 + y^3 = S$$

$$\text{let } y = 10 - x \rightarrow S(x) = x^3 + (10 - x)^3$$

$$S'(x) = 3x^2 + 3(10 - x)^2(-1) = 3x^2 - 3[100 - 20x + x^2] = 0$$

$$\rightarrow x^2 - 100 + 20x - x^2 = 0$$

$$\rightarrow 20x = 100$$

$$x = \frac{100}{20} = 5$$

$$\rightarrow y = 5$$

(5, 5)