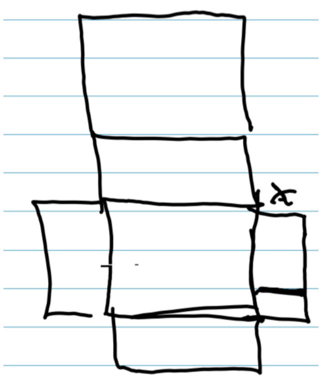
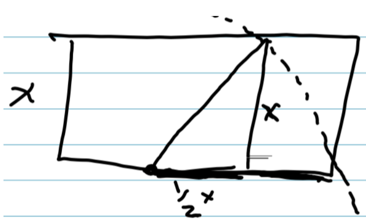
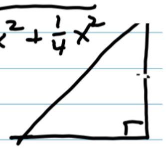
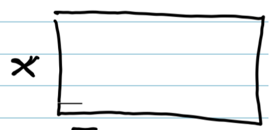
Golden Rectangle on 4 sides of a prism (box).
At what value of "x" is the value of the volume (V) equal to the value of the total surface area (TSA)?





$$\sqrt{x^2 + \tfrac{1}{4}x^2} = \sqrt{\tfrac{5}{4}x^2} = \frac{\sqrt{5}}{2}x$$





$$\frac{\sqrt{5}}{2}x + \frac{1}{2}x$$

$$l = \frac{\sqrt{5}+1}{2}x$$

$$\text{Area} = \left(\sqrt{5}+1\right)x^2$$

$$V = \left(\frac{\sqrt{5}+1}{2}x^2\right)\left(\frac{\sqrt{5}+1}{2}x\right) = \frac{5+2\sqrt{5}+1}{4}x^3 = \left(\frac{3+\sqrt{5}}{2}\right)x^3$$

$$\text{TSA} \quad 4\left(\frac{\sqrt{5}+1}{2}\right)x^2 + 2\left(\frac{\sqrt{5}+1}{2}x\right)^2$$

$$\left(2\sqrt{5}+2\right)x^2 + \cancel{2}\left(3+\sqrt{5}\right)x^2$$

$$\left(5+3\sqrt{5}\right)x^2$$

$V = TSA$

$$x^2\left(\frac{3+\sqrt{5}}{2}x - 5+3\sqrt{5}\right) = 0$$

$x = 0$ or

Let V=TSA & move all terms to same side. Factor out an x^2.
Set each factor = 0 & solve.

add the 5+3Sqrt(5) to both sides.
Divide both sides (multiple by reciprocal) of (3+sqrt(5)/2

$$x = \frac{5+3\sqrt{5}}{3+\sqrt{5}} \cdot 2$$

rationalize the denominator by multiplying by the conjugate.

$(10+6\sqrt{5})(3+\sqrt{5})$

$* \; 3-\sqrt{5}$

$30-10\sqrt{5}+18\sqrt{5}-30$

$$\frac{8\sqrt{5}}{9-5} = \frac{8\sqrt{5}}{4}$$

$2\sqrt{5}$

$2\sqrt{5} = \sqrt{20}$