

Week 11 Problem of the Week

Math 150

In a right triangle with legs of x^2, x^4 and a hypotenuse of x^6 , find the value of x .

$$(x^2)^2 + (x^4)^2 = (x^6)^2 \Rightarrow x^{12} - x^8 - x^4 = 0$$

$$x^4(x^8 - x^4 - 1) = 0$$

$x^4 = 0$
 $x = 0$
silly

$$\left\{ \begin{array}{l} \text{let } w = x^4 \end{array} \right.$$

$$w^2 - w - 1 = 0$$

$$w = \frac{1 \pm \sqrt{(-1)^2 - 4(1)(-1)}}{2}$$

$$w = \frac{1 \pm \sqrt{5}}{2}$$

(golden ratio) $\frac{1 + \sqrt{5}}{2}$

$$\frac{1 - \sqrt{5}}{2}$$

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

$$\sqrt[4]{x^4} = \sqrt[4]{\frac{1 - \sqrt{5}}{2}}$$

imaginary

$$x = \sqrt[4]{\frac{1 + \sqrt{5}}{2}}$$