

Week 8 Problem of the Week

Math 170

Solve for x.

(Excuse the bad formatting, the 5 in front of the radical is intended to be the index, so it should read "the fifth root of...")

① Raise both sides to 5th power

$$\left(\sqrt[5]{\frac{5^{12} + 5^x}{5^x + 5^2}} \right)^5 = (5)^5$$

$$\frac{5^{12} + 5^x}{5^x + 5^2} = 5^5$$

$$\frac{5^{12} + 5^x}{-5^7} = \frac{5^{x+5} + 5^7}{-5^x - 5^7}$$

$$5^{12} - 5^7 = 5^{x+5} - 5^x$$

Factor on both sides....

$$\frac{5^7(5^5 - 1)}{(5^5 - 1)} = \frac{5^x(5^5 - 1)}{(5^5 - 1)} \quad \text{constant factor}$$

$$5^7 = 5^x$$

$$x = 7$$