

Recall that

$$x = \sqrt[3]{\left(\frac{-b^3}{27a^3} + \frac{bc}{6a^2} - \frac{d}{2a}\right) + \sqrt{\left(\frac{-b^3}{27a^3} + \frac{bc}{6a^2} - \frac{d}{2a}\right)^2 + \left(\frac{c}{3a} - \frac{b^2}{9a^2}\right)^3}} + \sqrt[3]{\left(\frac{-b^3}{27a^3} + \frac{bc}{6a^2} - \frac{d}{2a}\right) - \sqrt{\left(\frac{-b^3}{27a^3} + \frac{bc}{6a^2} - \frac{d}{2a}\right)^2 + \left(\frac{c}{3a} - \frac{b^2}{9a^2}\right)^3}} - \frac{b}{3a}$$

1) Find 3 solutions to this equation:

$$x^3 + x^2 + x + 1 = 0$$

2) Show that the general solution above solves the equation

$$ax^3 + bx^2 + cx + d = 0$$

3) Find an example of something in math, science or elsewhere that behaves like a group and describe it.

Project:

Find a partner to work with. Pick a number that you think is interesting and describe in a 1-2 page paper what it is that is interesting about the number. If it is a obvious example like  $\pi$  please find something interesting about it that you did not know before hand. Feel free to use the Internet, but do not plagiarize. Cite any sources you use. Do not copy and paste anything unless it is short and illustrates some point.

Be prepared to give a 3-4 minute presentation on August 17th, the last day of class.

Here are some suggestions

Euler's constant

The Golden ratio

MONstrous Moonshine

The largest known Mersenne prime

Ramanujan and 1729

Kaprekar's constant

998001