$$\sqrt{i}$$

Below are several investigation questions involving i and square roots. Answer each question fully, showing work and giving written explanations with each problem. Spend at least one hour working independently on the questions before you share your ideas with a friend. You may not use the internet as a resource. Partial credit will be given for good ideas not necessarily leading to a complete solution.

1. Evaluate $\left(1+i\right)^2$. Use your work to find a number $z = a + bi$ with $z^2 = i$. (2 pts.)

2. $(1+2i)^2 = -3 + 4i.$ Find complex numbers $z = a + bi$ with   (3 pts.)

    a. $z^2 = 3 + 4i$
    b. $z^2 = 3 - 4i$
    c. $z^2 = -3 - 4i$

3. Find real numbers a, b with $(a + bi)^2 = 2 + 5i.$ You may either express a, b exactly as square roots or approximately as decimals accurate to the third decimal place. (3 pts.)

4. Observe

$$(1+2i)^2 = -3 + 4i$$

$$(2+3i)^2 = -5 + 12i$$

$$(1+4i)^2 = -15 + 8i$$

Do these numbers look familiar? The numbers on the right are the start to Pythagorean Triples!

$$3^2 + 4^2 = 5^2$$

$$5^2 + 12^2 = 13^2$$

$$15^2 + 8^2 = 17^2$$

Try several more examples of your own and describe the pattern you see. (Full sentences)

Use your observations to help you find all integral Pythagorean Triples (a, b, c) with $0 < a, b < c \leq 50$.   (4 pts.)

Your response may be typed or neatly handwritten. It is due Monday, October 26.