Problem 1: If the six solutions of $x^6 = -64$ are written in the form $a + bi$, where $a$ and $b$ are real, then find the product of the solutions with $a > 0$. (Source: AHSME)

The sixth roots of unity are

$1, e^{2\pi i/6}, e^{4\pi i/6}, e^{6\pi i/6}, e^{8\pi i/6}, e^{10\pi i/6}$

Now let $x^6 = -64$. We have $x = \sqrt[6]{-64} = 2\sqrt[6]{-1} = 2i$.

We can get all six solutions if we multiply $2i$ by each of the sixth roots of unity.

$x = 2i, 2ie^{2\pi i/6}, 2ie^{4\pi i/6}, 2ie^{6\pi i/6}, 2ie^{8\pi i/6}, 2ie^{10\pi i/6}$

Converting these solutions to rectangular form, we get

$x_1 = 2i$ $x_2 = 2i(\frac{1}{2} + \frac{\sqrt{3}}{2}i) = -\sqrt{3} + i$ $x_3 = 2i(-\frac{1}{2} + \frac{\sqrt{3}}{2}i) = -\sqrt{3} - i$ $x_4 = 2i(-1 + 0) = -2i$
$x_5 = 2i(-\frac{1}{2} - \frac{\sqrt{3}}{2}i) = \sqrt{3} - i$ $x_6 = 2i(\frac{1}{2} - \frac{\sqrt{3}}{2}i) = \sqrt{3} + i$

There are only two solutions with $a > 0$, where $a$ is the real part of the complex number. These solutions are $x_5 = \sqrt{3} - i$ and $x_6 = \sqrt{3} + i$. Their product is $\boxed{(\sqrt{3} - i)(\sqrt{3} + i) = 4}$.