Test problems about complex numbers

1. Find absolute values and arguments of the following complex numbers:
   1) \( z = 3 \); 2) \( z = 1 + i \); 3) \( z = -\cos \frac{\pi}{3} + i \sin \frac{\pi}{3} \); 4) \( z = \frac{1-i}{1+i} \); 5) \( z = (4+3i)^8 \)

2. Give geometric description of the sets of points in \( \mathbb{C} \) which satisfy the inequalities:
   1) \( \text{Re}\ z > 0 \); 2) \( \text{Im}\ z \leq 1 \); 3) \( |z| < 1 \); 4) \( |z| < 2 \); 5) \( |z-1| > 1 \);
   6) \( 1 < |z| < 2 \); 7) \( 0 < \arg z < \frac{\pi}{4} \); 8) \( |\pi - \arg z| < \frac{\pi}{4} \);
   9) \( \text{Re}(2z^2) > 0 \).

3. Which lines in the complex plane are represented by the equations:
   1) \( \text{Im}\ z = 5 \); 2) \( \text{Re}(3z^2) = 0 \); 3) \( \text{Re}(3\overline{z}) = -1 \); 4) \( \text{Re} \frac{i}{z} = 2 \); 5) \( \text{Im}\ \frac{z-1}{z+1} = 0 \)