Zadatak 2. Odredi realni i imaginarni dio sljedećih kompleksnih brojeva:

1) $\left(\dfrac{i^5+2}{i^{19}+1}\right)^2$; **2)** $\dfrac{(1+i)^5}{(1-i)^3}$; **3)** $\left(\dfrac{2}{1+i\sqrt{3}}\right)^4$.

Rješenje. **1)** $z=\left(\dfrac{i^5+2}{i^{19}+1}\right)^2=\left(\dfrac{2+i}{1+i^3}\right)^2=\left(\dfrac{2+i}{1-i}\cdot\dfrac{1+i}{1+i}\right)^2=\left(\dfrac{2+i+2i-1}{1+1}\right)^2=$
$\left(\dfrac{1+3i}{2}\right)^2=\dfrac{1}{4}(1+3i)^2=\dfrac{1}{4}(1+6i-9)=\dfrac{1}{4}(-8+6i)=-2+\dfrac{3}{2}i,$
$\operatorname{Re} z=-2,\ \operatorname{Im} z=\dfrac{3}{2}$;

2) $z=\dfrac{(1+i)^5}{(1-i)^3}=\dfrac{1+5i+10i^2+10i^3+5i^4+i^5}{1-3i+3i^2-i^3}=\dfrac{1+5i-10-10i+5+i}{1-3i-3+i}=$
$\dfrac{-4-4i}{-2-2i}=\dfrac{-4(1+i)}{-2(1+i)}=2,\ \operatorname{Re} z=2,\ \operatorname{Im} z=0$;

3) $z=\left(\dfrac{2}{1+i\sqrt{3}}\right)^4=\dfrac{16}{1+4i\sqrt{3}+6i^2\cdot 3+4i^3 3\sqrt{3}+i^4\cdot 9}=\dfrac{16}{1+4i\sqrt{3}-18-12i\sqrt{3}+9}=$
$\dfrac{16}{-8-8i\sqrt{3}}=\dfrac{16}{-8(1+i\sqrt{3})}=\dfrac{-2}{1+i\sqrt{3}}\cdot\dfrac{1-i\sqrt{3}}{1-i\sqrt{3}}=\dfrac{-2+2i\sqrt{3}}{1+3}=-\dfrac{1}{2}+\dfrac{\sqrt{3}}{2}i,\ \operatorname{Re} z=$
$-\dfrac{1}{2},\ \operatorname{Im} z=\dfrac{\sqrt{3}}{2}$.