(3) $\dfrac{(5-3i)(2+i)}{4+2i} = \dfrac{10+5i-6i-3i^2}{4+2i} = \dfrac{10+3-i}{4+2i} = \dfrac{13-i}{4+2i} \times \dfrac{4-2i}{4-2i}$

$= \dfrac{52-4i-26i+2i^2}{4^2-(2i)^2} = \dfrac{52-30i-2}{16-4i^2}$

$= \dfrac{50-30i}{16+4} = \dfrac{50-30i}{20} = \dfrac{5}{2} - \dfrac{3i}{2} = a+ib$

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(4) ~~1+2i~~ $\dfrac{(1+i)(2+i)}{3+i} = \dfrac{2+i^2+2i+i}{3+i} = \dfrac{2-1+3i}{3+i}$

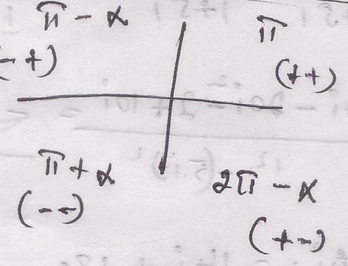
$= \dfrac{1+3i}{3+i} \times \dfrac{3-i}{3-i} = \dfrac{(1+3i)(3-i)}{3^2-i^2}$

$= \dfrac{3-i+9i-3i^2}{9+1} = \dfrac{3+8i+3}{10}$

$= \dfrac{6+8i}{10} = \dfrac{3+4i}{5} = \dfrac{3}{5} + \dfrac{4i}{5}$

Cube root

$r = ?$
$\alpha = ?$
quadrant = ?
$\theta = ?$



(1) $1-i$

$\Rightarrow$ Let $z = x+iy = 1-i$

$\Rightarrow r = \sqrt{x^2+y^2} = \sqrt{1+1} = \sqrt{2}$

$\alpha = \tan^{-1}\left|\dfrac{y}{x}\right| = \tan^{-1}\left|\dfrac{-1}{1}\right| = \pi/4$ radian

Here $z = 1-i = (1,-1)$ is in 4th quadrant

$\theta = 2\pi - \alpha = 2\pi - \pi/4 = \dfrac{7\pi}{4}$

therefore, $z = \sqrt{2}\left[\cos\left(\dfrac{7\pi}{4}\right) + i\sin\left(\dfrac{7\pi}{4}\right)\right]$

or $z = \sqrt{2}\left[\cos\left(\dfrac{2k\pi+7\pi}{4}\right) + i\sin\left(2k\pi + \dfrac{7\pi}{4}\right)\right]$