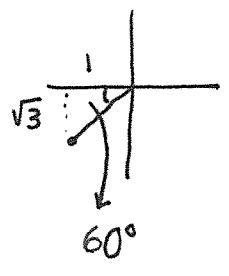


Bonus Exercise
 Powers & roots of
 Complex #s
 201-943-DW Sol
 Fall 2014

Q Find the two solutions to $x^2 = -1 - \sqrt{3}j$
 in EXACT rectangular form

Solution:

$-1 - \sqrt{3}j$ in exponential form (2 different exponential forms representing same complex #)

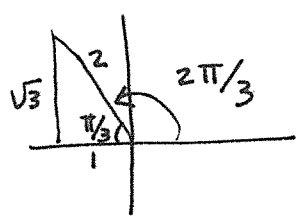


$\theta = 240^\circ$ or $4\pi/3$
 $r = 2$

exp: $2e^{4\pi/3j}$ ① $2e^{10\pi/3j}$ ②

Apply $\sqrt{\quad}$:

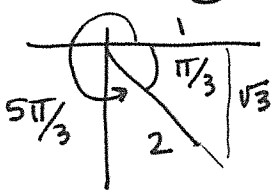
① $(2e^{4\pi/3j})^{1/2} = \sqrt{2}e^{4\pi/6j} = \sqrt{2}e^{2\pi/3j}$



$= \sqrt{2} \cos 2\pi/3 + \sqrt{2} \sin 2\pi/3 j$
 $= \sqrt{2} \left(-\frac{1}{2}\right) + \sqrt{2} \left(\frac{\sqrt{3}}{2}\right) j$
 $= \left| -\frac{\sqrt{2}}{2} + \frac{\sqrt{6}}{2} j \right|$

②

$(2e^{10\pi/3j})^{1/2} = \sqrt{2}e^{10\pi/6j} = \sqrt{2}e^{5\pi/3j}$



$= \sqrt{2} \cos 5\pi/3 + \sqrt{2} \sin 5\pi/3 j$
 $= \sqrt{2} \left(\frac{1}{2}\right) + \sqrt{2} \left(-\frac{\sqrt{3}}{2}\right) j$
 $= \left| \frac{\sqrt{2}}{2} - \frac{\sqrt{6}}{2} j \right|$