BONUS (Complex Numbers) Exponential Form 943-DW Solutions Fall 2011

1 a. $5\cos 54° + 5\sin 54°\,j$

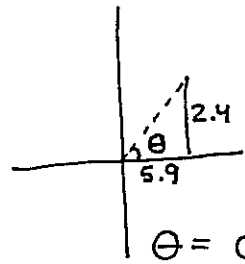
$54° = 54 \cdot \frac{\pi}{180} = 0.94$

$\boxed{5e^{0.94j}}$

b. $5.9 + 2.4j$

$r^2 = 5.9^2 + 2.4^2$

$r = 6.37$



$\theta = 0.39$

$\boxed{6.4e^{0.39j}}$

c. $47.3 - 10.9j$

$r = 48.5$

$\theta = 6.06$

$\boxed{48.5e^{6.06j}}$

d. $-3 + j$

$r = \sqrt{10}$

$\theta = 2.82$

$\boxed{\sqrt{10}e^{2.82j}}$

2 a. $3e^{21j}$

! Remember angles are in rad

$3\cos 21 + 3\sin 21\,j$

$= \boxed{-1.64 + 2.51j}$

b. $2e^{56j}$

$= \boxed{1.7 - 1.59j}$

c. $3.2e^{222j}$

$= \boxed{-1.59 + 2.78j}$

d. $5e^{-59j}$

$= \boxed{-3.85 - 3.18j}$

(3) Solve for z

a. $(2+j)z + 3 - j = 0$

$$z = \frac{-3+j}{2+j}\left(\frac{2-j}{2-j}\right)$$

$$= \frac{-6+5j-j^2}{5} = \frac{-5+5j}{5} = \boxed{-1+j}$$

b. $(4+3j)(2-j)z - (7+2j)z = 4-2j$

$$(8+2j-3j^2)z - 7z - 2jz = 4-2j$$

$$(11+2j)z - 7z - 2jz = 4-2j$$

$$11z + 2jz - 7z - 2jz = 4-2j$$

$$z(11+2j-7-2j) = 4-2j$$

$$z(4) = 4-2j$$

$$\boxed{z = 1 - \tfrac{1}{2}j}$$

c. $4z^2 - 2z + 15 = 0$

$$z = \frac{2 \pm \sqrt{4 - 4(4)(15)}}{8} = \frac{2 \pm \sqrt{-236}}{8} = \frac{1}{4} \pm \frac{2\sqrt{59}}{4}j$$

$$= \boxed{\frac{1}{4} \pm \frac{\sqrt{59}}{2}j}$$

d. $z^2 - z + 3 = 0$

$$z = \frac{1 \pm \sqrt{1 - 4(1)(3)}}{2}$$

$$= \frac{1}{2} \pm \frac{\sqrt{-11}}{2} = \boxed{\frac{1}{2} \pm \frac{\sqrt{11}}{2}j}$$

(4) Express in polar coordinates

a. $-8-12j$ = $\boxed{14.42 \angle 236.31°}$

b. $3-4j$ = $\boxed{5 \angle 306.9°}$

c. $7+5j$ = $\boxed{8.6 \angle 35.54°}$

d. $-0.55j + 0.24j$

$= -0.31j$

= $\boxed{0.31 \angle 270°}$

e. $-2j$ = $\boxed{2 \angle 270°}$

(5) Give in rectangular form

a. $\boxed{1.5+2.6j}$

b. $\boxed{-3.54+3.54j}$

c. $\boxed{-6}$

d. $\boxed{15}$