Team Name: _____ **Section:** _____

Members Present (full names printed):
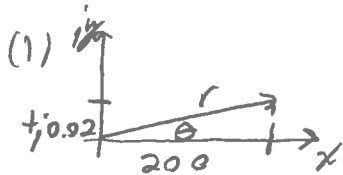
1) _____
2) _____
3) _____
4) _____

(INSTRUCTOR

Sols)

Conversions – Show all your work
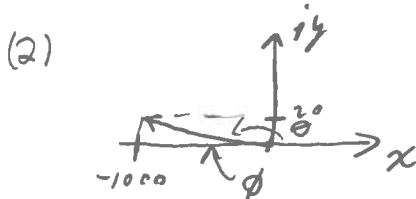
1) Convert 200 + j0.02 to polar form (angle in degrees)
2) Convert -1000 + j20 to polar form (angle in degrees)
3) Convert 6<40° to rectangular form

(1)

$(200)^2 + (0.02)^2 = r^2$ ∴ $r = 200$

$TAN\theta = {}^b/_a = \dfrac{.02}{200}$ ∴ $\theta = 5.73 \times 10^{-3}$ °

$$200 \angle 5.73 \times 10^{-3}{}°$$

(2)

$(1000)^2 + (20)^2 = r^2$ ∴ $r = 1,000.2$

$TAN(\phi) = \dfrac{20}{1000}$ ∴ $\phi = 1.146°$

HENCE $\theta = 180° - 1.146°$
       $= 178.85°$

$$1,000 \angle 178.9°$$

(3)

$Cos(\theta) = \dfrac{adj}{6}$ ∴ $a = 6 Cos(40°) = 4.596$
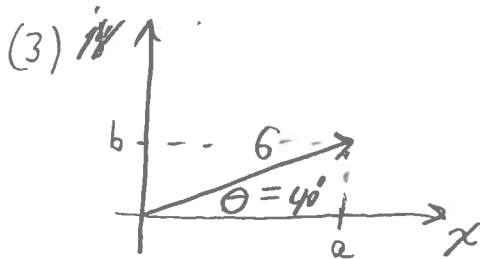
$SIN(\theta) = \dfrac{opp}{6}$ ∴ $b = 6 SIN(40°) = 3.857$

OR $6 \angle 40° = \boxed{4.596 + j3.857}$

17.89 ∠ -116.6°

17.89 ∠ 243.4°
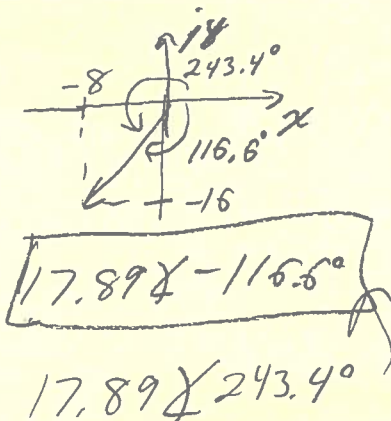
Conversions – Use your calculator

4) Convert -8 - j16 to polar form (angle in degrees)
5) Convert 2000 < -90° to rectangular form
6) Convert 15<180° to rectangular form

$$17.89 \angle -116.6°$$

$$-j2000$$

$$-15 + j0$$

Addition and Subtraction – Show your work

Solve the following (answers in rectangular form):

    7) (4.2 + j6.8) + (7.6 +j0.2)
    8) (6.8 – j4.2) – (0.2+j7.6)
    9) 6<40⁰ - (15+j0)

(7) 4.2 + j6.8
 + 7.6 + j0.2
    $\boxed{11.8 + j7.0}$

(8) (6.8 – j4.2)
 – (0.2 + j7.6)
    $\boxed{6.6 – j11.8}$

(9) 6<40° → 4.596 + j3.857
          –(15 + j0)
        $\boxed{-10.404 + j3.857}$

Addition and Subtraction – Use your calculator

Solve the following (answers in rectangular form): $\boxed{- 3.33 – j1.03}$

    10) 10<80⁰- 12 <65⁰
    11) (4.2 + j6.8) - (7.6 +j0.2) → $\boxed{- 3.4 + j6.6}$
    12) (6.8 + j4.2) + (0.2+j7.6) → $\boxed{7.0 + j11.8}$

Multiplications and Division – Show your work

Solve the following (answers in polar form, angles in degrees):

13) (2 + j3)(6 + j8)
14) 2<60°/12 <65°
15) (2 + j3)/(6 + j8)

(13) $(2+j3)(6+j8) = 12 + j16 + j18 + j^2 24$

$= 12 + j34 - 24 = -12.0 + j34$

$= \boxed{36.06 \angle 109.4°}$

(14) $\dfrac{2\angle 60°}{12 \angle 65°} = \dfrac{2}{12} \angle (60° - 65°) = \dfrac{1}{6} \angle -5° \approx \boxed{0.166 \angle -5°}$

(15) $(2+j3)/(6+j8) = \dfrac{3.606 \angle 56.31°}{10.0 \angle 53.13°} = \dfrac{3.606}{10.0} \angle 56.31° - 53.13°$

$\boxed{360.6 \times 10^{-3} \angle 3.18°}$

Multiplications and Division – Use your calculator

Solve the following (answers in polar form, angles in degrees):

16 14) (3 + j3)(7 + j8) → $\boxed{45.1 \angle 93.8°}$
17 15) 3<45°/1<5° → $\boxed{3 \angle 40°}$
18 16) (2 - j3)/(6 + j2) → $\boxed{571 \times 10^{-3} \angle -74.7°}$

Conjugation and Problem Solving

19) Find the complex conjugate of (3 + j4)

$$3 - j4$$

20) Find the complex conjugate of 3<45°

$$3 \angle - 45°$$

21) Find x if: (5x + j10)(2 – j3)= 90 - j70

$$(5x + j10)(2 - j3) = 10x - j15x + j20 - j^2 30$$
$$= (10x + 30) + j(-15x + 20) = 90 - j70$$

$$10x + 30 = 90 \qquad\qquad -15x + 20 = -70$$
$$10x = 60 \qquad\qquad OR \quad -15x = -90$$
$$x = 6 \qquad\qquad\qquad x = 6$$

$$\therefore \boxed{x = 6}$$

22) Find θ if: 80<0°/20<θ°=3.464 - j2   → $4 \angle - 30°$

$$\frac{80 \angle 0°}{20 \angle \theta°} = 4 \angle - 30°$$

$$4 \angle (0 - \theta)° = +30°$$

$$\therefore \boxed{\theta = +30°}$$