

(20) ① a) Let $\vec{w} = 2\mathbf{i} - \mathbf{j}$, $\vec{v} = 4\mathbf{i} + 2\mathbf{j}$
 Find $2\vec{w} - \vec{v}$

b) Let P and Q be the points (1, 4) and (-3, 8) respectively. Express the vector \vec{PQ} in $x\mathbf{i} + y\mathbf{j}$ form.

c) Find a unit vector \vec{u} with the same direction as $\vec{v} = 3\mathbf{i} - 7\mathbf{j}$

d) If $\|\vec{v}\| = 6$, write the vector \vec{v} in the form $x\mathbf{i} + y\mathbf{j}$ if the angle it makes with the positive x axis is 300° .

(15) ② Put answers in $a + bi$ form:

a) $2 + 3i - (1 - 4i)^2$

b) Divide: $\frac{1 - i}{3 + i}$

c) $i^0 + i^1 + i^2 + i^3 + i^4$

(5) ③ Solve (in $a + bi$ form)

$$x^2 + 6x + 25 = 0.$$

(10) ④ a) Convert $4.31 \text{cis } 98^\circ$ to

rectangular form. (2 dec. place values)

b) Multiply $(2 \text{cis } 100^\circ)(4 \text{cis } 7^\circ)$.

leave answer in polar form.

(10) ⑤ a) Find $(1 - i\sqrt{3})^3$ using De Moivre's Theorem.

Answer in rectangular form.

b) Find all fourth roots of -16 . Put

answers in exact rectangular form

MAC 114 EXAM II KEY (SP'17)

① a) $2(2i - j) - (4i + 2j) = 4i - 2j - 4i - 2j = -4j$

b) $(-3 - 1)i + (8 - 4)j = -4i + 4j$

c) $\vec{u} = \frac{\vec{v}}{\|\vec{v}\|} = \frac{3i - 7j}{\sqrt{9 + 49}} = \frac{3i - 7j}{\sqrt{58}} \quad \text{or} \quad \frac{3}{\sqrt{58}}i - \frac{7}{\sqrt{58}}j$

2) $x = 6 \cos 300^\circ = 6\left(\frac{1}{2}\right) = 3$

$y = 6 \sin 300^\circ = 6\left(-\frac{\sqrt{3}}{2}\right) = -3\sqrt{3}$

$3i - 3\sqrt{3}j$

② a) $2 + 3i - (1 - 8i + 16i^2) = 2 + 3i - (-15 - 8i)$

$= 2 + 3i + 15 + 8i = 17 + 11i$

b) $\frac{1-i}{3+i} \cdot \frac{3-i}{3-i} = \frac{3-3i-i+i^2}{9+1} = \frac{2-4i}{10} \quad \text{since } i^2 = -1.$

c) $x + i - x - i + 1 = 1$

③ $x = \frac{-6 \pm \sqrt{36 - 4(1)(25)}}{2(1)} = \frac{-6 \pm \sqrt{-64}}{2} = \frac{-6 \pm 8i}{2}$

$\text{or } -3 \pm 4i$

④ a) $4.31(\cos 98^\circ + i \sin 98^\circ) = -.60 + 4.27i$

b) $8 \text{ cis } 107^\circ$

⑤ a) $(2 \text{ cis } 300^\circ)^3 = 8 \text{ cis } 900^\circ$

$= 8 \text{ cis } 180^\circ = -8$

b) $-16 = 16 \text{ cis } 180^\circ$

$16^{1/4} \text{ cis } \left(\frac{180^\circ + 360^\circ k}{4}\right)$

$2 \text{ cis } 45^\circ = 2\left(\frac{\sqrt{2}}{2} + \frac{\sqrt{2}}{2}i\right) = \sqrt{2} + \sqrt{2}i$

$2 \text{ cis } 135^\circ = -\sqrt{2} + \sqrt{2}i$

$2 \text{ cis } 225^\circ = -\sqrt{2} - \sqrt{2}i$

$2 \text{ cis } 315^\circ = \sqrt{2} - \sqrt{2}i$