(MWF, 60 pts.)

MAC 1114 EXAM I MR. NADEL FALL 2013

(20) ① a) Let $\vec{v} = 2i - 3j$, $\vec{w} = i + 4j$.
Find and simplify $3\vec{v} - 4\vec{w}$.

b) Let P and Q be the points $(-1, 5)$ and $(2, 4)$ respectively. Express the vector $\vec{PQ}$ in $xi + yj$ form.

c) If $\vec{v} = 3i - 5j$, Find $\|\vec{v}\|$.

d) If $\|\vec{v}\| = 4$, write the vector $\vec{v}$ in the form $xi + yj$ if the angle it makes with the positive x axis is 210°.

(15) ② Put answers in $a + bi$ form:

a) $5(2+3i)^2 - (2+i)$

b) Divide: $\dfrac{3-i}{4+i}$

c) $2i^{29} - i^{26}$

(5) ③ Solve (in $a + bi$ form)
$x^2 + 4x + 9 = 0$.

(10) ④ a) Convert $3.4 - 2.7j$ to polar form with $r > 0$, $0^\circ \leq \theta \leq 360^\circ$.

b) Divide $\dfrac{12 \operatorname{cis} 100^\circ}{3 \operatorname{cis} 72^\circ}$ Leave answer in polar form.

(10) ⑤ a) Find $(-\sqrt{2} - \sqrt{2}i)^5$ using DeMoivre's Theorem. Answer in rectangular form.

b) Find all cube roots of -64. Put answers in exact rectangular form.

MWF

MAC 1114 EXAM II KEY (F'13)

① a) $3(2i-3j)-4(i+4j) = 6i-9j-4i-16j = 2i-25j$

b) $[2-(-1)]i + (4-5)j = 3i-j$

c) $\|\vec{v}\| = \sqrt{3^2+5^2} = \sqrt{34}$

d) $4((\cos 210°)i + (\sin 210°)j) = 4\left(-\frac{\sqrt{3}}{2}i - \frac{1}{2}j\right) = -2\sqrt{3}i - 2j$

② a) $5(4+12i+9i^2) - 2 - i = 5(-5+12i) - 2 - i$

$= -25 + 60i - 2 - i = -27 + 59i$

b) $\frac{3-i}{4+i}\,\frac{4-i}{4-i} = \frac{12-7i+i^2}{16+1} = \frac{11-7i}{17}$ OR $\frac{11}{17} - \frac{7}{17}i$

c) $2i - (-1) = 2i + 1 = 1 + 2i$

③ $x = \frac{-4 \pm \sqrt{16-4(1)(9)}}{2(1)} = \frac{-4 \pm \sqrt{-20}}{2}$

$= \frac{-4 \pm 2\sqrt{5}i}{2} = -2 \pm \sqrt{5}\,i$

④ a) $r = \sqrt{3.4^2 + 2.7^2} \approx 4.34$

$\tan\alpha = \frac{2.7}{3.4}$ $\alpha \approx 38.5° \Rightarrow \theta \approx 321.5°$

$4.34\,\text{cis}\,321.5°$

b) $4\,\text{cis}\,28°$

⑤ a) $r = \sqrt{2+2} = 2$, $\theta = 225°$ (in QIII)

$(2\,\text{cis}\,225°)^5 = 32\,\text{cis}\,1125°$

$= 32\,\text{cis}\,45°$

$= 32\left(\frac{\sqrt{2}}{2} + \frac{\sqrt{2}}{2}i\right) = 16\sqrt{2} + 16\sqrt{2}\,i$

b) $64\,\text{cis}\,180°$

$64^{1/3}\,\text{cis}\left(\frac{180° + 360°K}{3}\right)$ $K = 0, 1, 2$

$4\,\text{cis}\,60° = 4\left(\frac{1}{2} + \frac{\sqrt{3}}{2}i\right) = 2 + 2\sqrt{3}\,i$

$4\,\text{cis}\,180° = -4$

$4\,\text{cis}\,300° = 4\left(\frac{1}{2} - \frac{\sqrt{3}}{2}i\right) = 2 - 2\sqrt{3}\,i$