(MWF, 70 pts.)

MAC 114 EXAM I MR. NADEL FALL 2009

(20) ① Sketch the following:

a) $r = 5\sin\theta$

b) $r = 1 - \sin\theta$

c) $r = 3\cos 2\theta$

d) $r\cos\theta = 2$

(20) ② a) If $A = (3, -4)$ and $B = (2, -5)$, represent $\overrightarrow{AB}$ in the form $xi + yj$.

b) If $\vec{v} = 3i - 2j$, $\vec{w} = i + 3j$, find $2\vec{v} - 4\vec{w}$. Simplify.

c) Find a unit vector $\vec{u}$ with the same direction as $\vec{v} = 2i - 5j$.

d) If $\|\vec{v}\| = 5$, write the vector $\vec{v}$ in the form $ai + bj$ if the angle it makes with the positive x axis is 225°. Give exact values.

(15) ③ Write answers in $x + yi$ form:

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

b) Divide:

$$\frac{1+i}{5-2i}.$$

c) $i^{39} + i^{28}$

(5) ④ Solve

$$2x^2 + x + 1 = 0$$

Leave answers in $a + bi$ form.

(10) ⑤ a) Multiply:

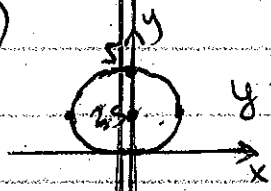
$(2\ \text{cis}\ 138°)(\sqrt{2}\ \text{cis}\ 105°)$

Leave answer in polar form.

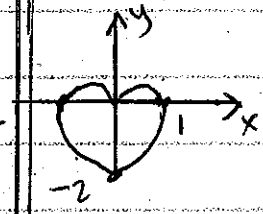
b) Write $5\ \text{cis}\ 98°$ in rectangular form. (2 decimal places)

MAC 1114 EXAM I KEY (F'09)

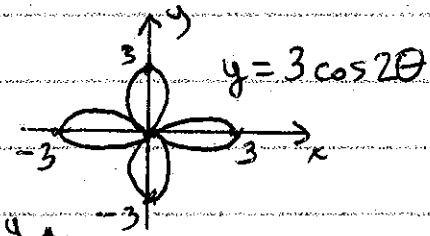
① a)



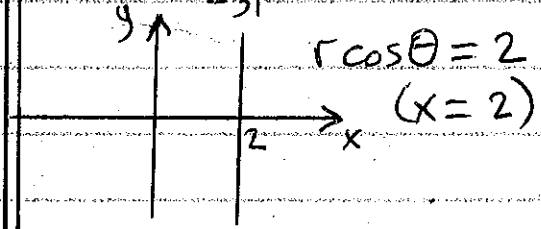
b)



c)



d)



② a) $\langle 2-3, -5-(-4)\rangle$

$= \langle -1, -1\rangle$

$= -i - j$

b) $2(3i-2j) - 4(i+3j)$

$= 6i - 4j - 4i - 12j$

$= 2i - 16j$

c) $\vec{u} = \frac{\vec{v}}{\|\vec{v}\|} = \frac{2i-5j}{\sqrt{29}}$

$= \frac{2}{\sqrt{29}}i - \frac{5}{\sqrt{29}}j$

d) $5[(\cos 225^\circ)i + (\sin 225^\circ)j]$

$= 5\left(-\frac{\sqrt{2}}{2}i - \frac{\sqrt{2}}{2}j\right)$

$= -\frac{5\sqrt{2}}{2}i - \frac{5\sqrt{2}}{2}j$

③ a) $25 + 30i + 9i^2 - 2 + i$

$= 25 + 30i - 9 - 2 + i$

$= 14 + 31i$

b) $\frac{1+i}{5-2i}\cdot\frac{5+2i}{5+2i} = \frac{5+7i+2i^2}{25+4}$

$= \frac{3+7i}{29}$

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

④ $x = \frac{-1 \pm \sqrt{1^2 - 4(2)(1)}}{2(2)}$

$= \frac{-1 \pm \sqrt{-7}}{4} = \frac{-1 \pm i\sqrt{7}}{4}$

⑤ a) $2\sqrt{2}\,\text{cis}\,243^\circ$

b) $5(\cos 98^\circ + i\sin 98^\circ)$

$= -.70 + 4.95i$