Fall '06/MAT 150/Worksheet 3 **Name:** Solution *Show all your work.*

1. (8pts) Put the following expressions into standard form $a + bi$:

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

$= -6 - 2i$

b) $\dfrac{1+i}{5-2i} =$ $\dfrac{1+i}{5-2i} \cdot \dfrac{5+2i}{5+2i} = \dfrac{5+2i+5i+2i^2}{5^2+2^2} = \dfrac{3+7i}{29} = \dfrac{3}{29} + \dfrac{7}{29}i$

c) (justify also) $i^{42} =$ $i^{40} \cdot i^2 = \underbrace{(i^4)^{10}}_{1} \cdot i^2 = i^2 = -1$

$42 \div 4 = 10$, rem. 2

Solve the equations algebraically:

2. (5pts) $x^4 + 2x^2 - 35 = 0$

$u = x^2$ $(x^2)^2 + 2x^2 - 35 = 0$

$u^2 + 2u - 35 = 0$

$(u+7)(u-5) = 0$

$u = -7, 5$

$x^2 = 5$ $\quad x^2 = -7$

$x = \pm\sqrt{5}$ $\quad x = \pm\sqrt{7}\,i$

3. (4pts) $|2x - 3| = 5$

$2x - 3 = 5$ or $2x - 3 = -5$

$2x = 8$ $\quad 2x = -2$

$x = 4$ $\quad x = -1$

$x = 4$ or -1

4. (7pts) Erin and Claudia bike to the same grocery store. It takes Claudia 15 minutes and Erin 20 minutes to ride to the store, since Erin lives 2 miles farther away than Claudia. Erin's bike speed is 4mph more than Claudia's.

a) What are the women's bike speeds?

b) How far is the store from Erin's house?

(Hint: convert time to hours.)

$s = vt$

	dist.	vel.	time
Claudia	s	v	$\frac{1}{4}$ hr
Erin	$s+2$	$v+4$	$\frac{1}{3}$ hr

$s = v \cdot \frac{1}{4}$

$s+2 = (v+4)\frac{1}{3}$

Substitute s in 2nd equation

$v \cdot \frac{1}{4} + 2 = (v+4)\frac{1}{3}$

$\frac{1}{4}v + 2 = \frac{1}{3}v + \frac{4}{3}$

$2 - \frac{4}{3} = \frac{1}{3}v - \frac{1}{4}v$

$\frac{2}{3} = \frac{1}{12}v \quad | \cdot 12$

$8 = v$

a) Claudia's speed is 8 mph

Erin's speed is 12 mph

b) Erin travels $12 \cdot \frac{1}{3} = 4$ miles

5. (6pts) How much water needs to be added to 3 liters of a 20% solution of muriatic acid in order to get a 15% solution?

	water	+	20% sol.	=	15% sol
	x		3		$x+3$
pure acid	0		$0.2 \cdot 3$		$0.15(x+3)$

$0.6 = 0.15(x+3)$

$0.6 = 0.15x + 0.45$

$0.15 = 0.15x$

$x = 1$ liter