Mathematics Department	1st bimester, FS 2011
Mr. Neeman	Total points possible: 20
Quiz #3, 10A	Solutions
Topic: Inequalities	Estimated time: 40 minutes

Instructions: Answer all the questions, working carefully and showing your work neatly. Make sure the final answer is easily identifiable.

#1. Solve the inequalitiy $x^3 + x^2 < x + 1$. (5 pts)
$x^3 + x^2 - x - 1 < 0$
$x^2(x+1) - (x+1) < 0$
$(x^2 - 1)(x+1) < 0$
$(x+1)^2(x-1) < 0$
The key values are $x = -1$ and $x = 1$. We do the table. Note that the last row is the product of the second and third rows.

	$x < -1$	$x = -1$	$-1 < x < 1$	$x = 1$	$x > 1$
$x+1$	-	0	+	+	+
$(x+1)^2$	+	0	+	+	+
$x-1$	-	-	-	0	+
$(x+1)^2(x-1)$	-	0	-	0	+

We're looking for it to be negative, so it's $x < -1$ and $-1 < x < 1$.

#2. Solve the inequality $x^2 + 2x - 8 \geq 0$. (4 pts)
$(x+4)(x-2) \geq 0$
The key values are $x = -4$ and $x = 2$. We do the table.

	$x < -4$	$x = -4$	$-4 < x < 2$	$x = 2$	$x > 2$
$x+4$	-	0	+	+	+
$x-2$	-	-	-	0	+
$(x+4)(x-2)$	+	0	-	0	+

We're looking for it to be 0 or positive, so we get $x \leq -4$ and $x \geq 2$.

#3. Solve the inequality $(x+3)(x^2+7) \geq 0$. (3 pts)
$x^2 + 7$ is an irreducible quadratic. This means it has no roots, since for it to be zero we would need $x^2 = -7$ which can't happen, whatever x is. So we know $x^+2 + 7 \neq 0$, and we can divide both sides by it. We get:
$x + 3 \geq 0$
$x \geq -3$.

#4. Solve the inequality $2\dfrac{x+1}{x-1} \leq -x + \dfrac{x^2}{x-1}$. (4 pts)

$\dfrac{2x+2}{x-1} + x - \dfrac{x^2}{x-1} \leq 0$

$\dfrac{2x+2+x^2-x-x^2}{x-1} \leq 0$

$\dfrac{x+2}{x-1} \leq 0$

Our key values are $x = -2$ and $x = 1$. We can do the table. Note the last row is the product of the first and third rows.

	$x < -2$	$x = -2$	$-2 < x < 1$	$x = 1$	$x > 1$
$x+2$	-	0	+	+	+
$x-1$	-	-	-	0	+
$\frac{1}{x-1}$	-	-	-	undef.	+
$\frac{x+2}{x-1}$	+	0	-	undef.	+

We're looking for it to be 0 or negative, so we get $-2 \leq x < 1$.

#5. Solve the inequality $2x^2 + 20x + 50 > 0$. (4 pts)

We can divide both sides by 2. Since 2 is positive, the inequality sign stays the same.

$x^2 + 10x + 25 > 0$

$(x+5)^2 > 0$

The key value is $x = -5$. We can do the table:

	$x < -5$	$x = 5$	$x > 5$
$(x+5)$	-	0	+
$(x+5)^2$	+	0	+

We're looking for it to be positive. So we get $x < -5$ and $x > 5$.