CSCI 2150 – Logic Simplification Homework Name: Answer Key

Basic Rules of Boolean Algebra

	OR	AND	XOR
Combined w/0	$A+0=A$	$A\cdot 0=0$	$A\oplus 0=A$
Combined w/1	$A+1=1$	$A\cdot 1=A$	$A\oplus 1=\overline{A}$
Combined w/self	$A+A=A$	$A\cdot A=A$	$A\oplus A=0$
Combined w/inverse	$A+\overline{A}=1$	$A\cdot\overline{A}=0$	$A\oplus\overline{A}=1$
Other rules	$A+A\cdot B=A$	$A+\overline{A}\cdot B=A+B$	$(A+B)\cdot(A+C)=A+B\cdot C$
DeMorgan's Th.	$\overline{A\cdot B}=\overline{A}+\overline{B}$		$\overline{A+B}=\overline{A}\cdot\overline{B}$

Prove each of the following theorems using the basic rules of boolean algebra shown above.
Please show all intermediate steps.

1. $A+\overline{A\cdot B}=1$

$A+\overline{A}+\overline{B}$	First, apply DeMorgan's Theorem to distribute the bar
$1+\overline{B}$	Anything OR'ed with its inverse equals 1
1	Anything OR'ed with 1 equals 1

2. $D+D\cdot\overline{B}+D\cdot\overline{C}=D$

$D\cdot(1+\overline{B}+\overline{C})$	First, pull a D out of all three terms
$D\cdot(1)$	Anything OR'ed with 1 equals 1
D	Anything AND'ed with 1 equals itself

3. $A\cdot(C+\overline{A})+\overline{A}+\overline{C}=1$

$A\cdot C+A\cdot\overline{A}+\overline{A}+\overline{C}$	Multiply A through the sum $C+\overline{A}$
$A\cdot C+0+\overline{A}+\overline{C}$	Anything AND'ed with its inverse equals 0
$A\cdot C+\overline{A}+\overline{C}$	Anything AND'ed with 0 equals itself
$A\cdot C+(\overline{A\cdot C})$	Apply DeMorgan's Theorem in reverse
1	Anything OR'ed with its inverse equals 1