Vector Subtraction

Recall that in mathematics,

$$a - b = a + (-b)$$

We refer to $-b$ as the opposite of b. For example, -5 is the opposite of 5. This mathematical principle is also true for vectors. In other words,

$$\vec{a} - \vec{b} = \vec{a} + (-\vec{b})$$

where $-\vec{b}$ represents the opposite of $\vec{b}$. The opposite of a vector has the same magnitude, but the opposite direction.

Example 1
If $A = 100\ m\ [E]$, what is the opposite of A?

This principle can be used in order to subtract one vector from another. Thus, **to subtract one vector from another, we change the subtraction question into an addition question by "adding the opposite" of the vector to be subtracted.**

Example 2
Given the vectors $A = 150\ m\ [N]$ and $B = 200\ m\ [W]$, find the resultant of $A - B$.

Example 3
A car is initially travelling at $20.0\ m/s\ [E]$ and then accelerates to $25.0\ m/s\ [S]$. What is the change in velocity of the car?

Homework
Carry out the following vector subtractions using **mathematical methods**:

1. $B - G$
2. $C - F$
3. $D - G$
4. $A - D$
5. $C - G$
6. $B - F$
7. $A - G$
8. $D - E$
9. $D - F$
10. $F - D$

$A = 100\ m\ [N]$
$B = 50\ m\ [E]$
$C = 42.5\ m\ [S]$
$D = 63.5\ m\ [W]$
$E = 94.5\ m\ [S]$
$F = 15\ m\ [N]$
$G = 175\ m\ [W]$