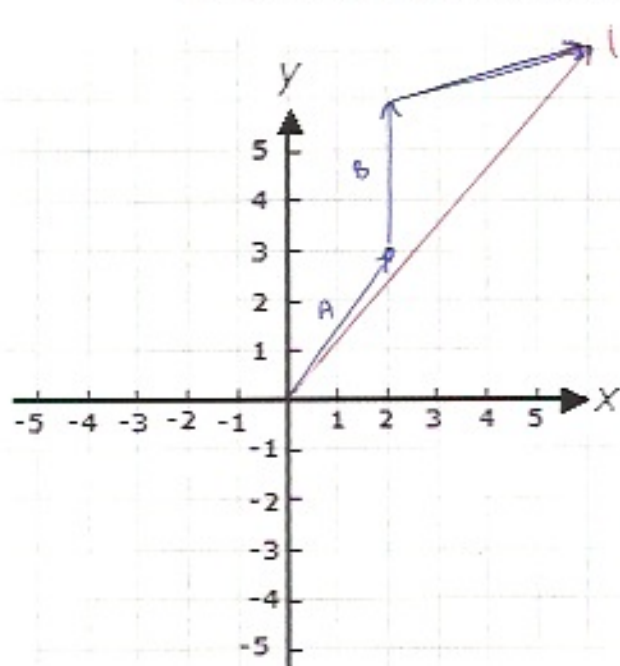**Physics: Class Examples**
    Mathematical Toolkit

Adding by Components:
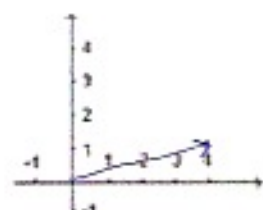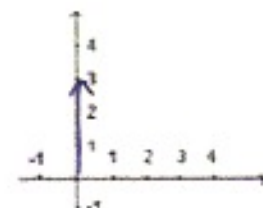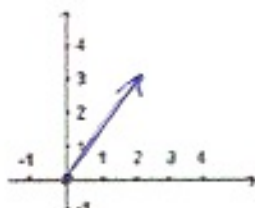When we add vectors, we connect the beginning of the second vector to the end of the first.

Example: We are given 3 vectors (A, B, and C)

Vector A (2, 3)

Vector B = (0,3)

Vector C = (4,1)

Sketch vectors A + B + C on the larger graph. Begin the first vector at the origin (0,0).

To find the resultant (when the vectors do not form right triangles) we can go through the process of adding by components.

Add together all the x-components from each vector
    $A_x = 2$
    $B_x = 0$
    $C_x = 4$

$A_x + B_x + C_x = 2 + 0 + 4 = 6$

Add together all the y-components from each vector
    $A_y = 3$
    $B_y = 3$
    $C_y = 1$

$A_y + B_y + C_y = 3 + 3 + 1 = 7$

These final sums give the rectangular coordinates for the resultant or final sum of vectors
A + B + C = Resultant (R_x, R_y)

Rectangular Coordinates for the resultant = $(6, 7)$

Change the Rectangular Coordinates into Polar Coordinates for the Resultant
Polar Coordinates for the resultant = $(9.22, \ 49.4°)$

$r = \sqrt{6^2 + 7^2}$ $\theta = \tan^{-1}\left(\frac{7}{6}\right)$
$r = \sqrt{36 + 49}$ $\theta = 49.4°$
$r = \sqrt{85} = 9.22$