CONCEPT: FORCE ON CURRENT-CARRYING WIRES

- Charges can move in space, OR inside a WIRE → CURRENT

CHARGES IN SPACE	CURRENT-CARRYING WIRES
- A moving Charge **PRODUCES** a NEW B-Field → B =	- A current-carrying wire **PRODUCES** a NEW B-Field → B =
- A Charge moving in an EXISTING Field **FEELS** a Force → F =	- A wire in an EXISTING Field **FEELS** a Force **(if i ≠ 0)** → F =

- Directions are given by the RIGHT HAND RULE Negative charges → LHR Currents → ALWAYS RHR

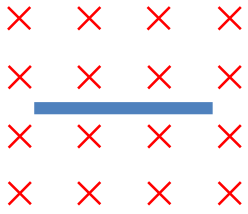
  - The Magnetic Force on a current-carrying wire will cause it to bend slightly:

    (i) current up: **(b)** current down:

EXAMPLE: A 2-meter-long wire is passed through a constant magnetic field, as shown below:

(a) If the wire experiences a force of 3 N when it has a current of 4 A, what is the strength of the field?

(b) If the wire experiences a downward force, what must the direction of the current be?



EXAMPLE: FORCE ON CURRENT-CARRYING WIRE AT AN ANGLE

A 2-m long wire is immersed in a 3 T magnetic field that is directed in the negative y axis. What is the magnitude of the magnetic force on the wire if it has 4 A flowing through it and it is directed**:**

(a) in the negative y axis **(b)** in the positive x axis **(c)** in a direction that makes 53^{o} with the +y axis

PRACTICE: CURRENT ON WIRE AT AN ANGLE

A 5-m current-carrying wire (red line) is ran through a 4 T magnetic field (blue lines), as shown**.** The angle shown is 30^{o}**.** What must the magnitude and direction of the current in the wire be when it feels a 3 N force directed into the page**?**