# Ideal Operational Amplifier Properties 23



## Clipping or Limiting

* An ideal op amp could provide an infinite output voltage range.
* A very good op amp could provide outputs at least up to the power supply voltages.
* Most op amps fall short by about two volts so with a 12 volt supply, the output would be only ten volts.
* The output should be directly proportional to the input. That is perfectly linear.

The image below shows ideal (black) and non-ideal (red and blue) behaviour including clipping when the op amp is saturated and the output voltage can go no higher.



## Gain Bandwidth Product(GBP)

**Gain x Frequency = GBP**

 The gain is calculated or measured from Vout / Vin
 The bandwidth is the frequency at which you wish to find the gain.
 The gain bandwidth product (GBP) is given in the device data sheet (or exam question).

**Gain Bandwidth Product Example**

Assume an amplifier has a gain-bandwidth-product of one million. Find the gain for a signal of 2000 Hz ...

 Gain x 2000 = 1000000 so Gain = 1000000 / 2000 = 500.