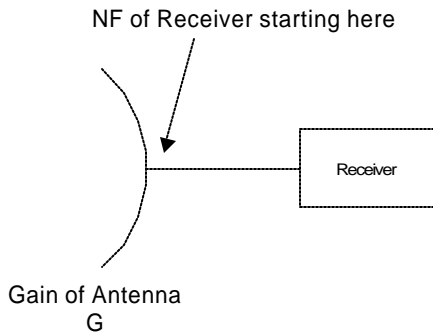


# Calculation of G/T of a Satellite Receiver using an Antenna

This sheet calculates the G/T of a antenna and receiver, for two antenna shapes.

It starts by calculating the gain G in dBs of the antennas and from the receiver NF in dBs gets the G/T of the receiver. Yellow is an input, green is an output



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$$c := 3 \cdot 10^8$$

$$\text{Frequency} := 1.6 \cdot 10^9$$

$$\text{Efficiency} := 0.85$$

## Use the parameters of a circular antenna to get the gain

$$G_c(\text{Diameter}) := 20 \cdot \log \left( \sqrt{\text{Efficiency} \cdot \pi} \cdot \frac{\text{Diameter} \cdot \text{Frequency}}{c} \right)$$

$$G_c(0.65) = 20.035 \quad \text{dB}$$

Need to operate with the antenna  
 off boresight so subtract 1dB

$$G_{\text{min}}(\text{Diameter}) := G_c(\text{Diameter}) - 1$$

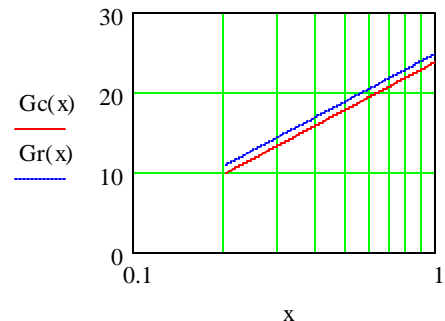
## Use parameters of a rectangular antenna to get the gain

$$G_r(\text{Ant}_x) := 10 \cdot \log \left[ 4 \cdot \pi \cdot \left( \frac{\text{Frequency}}{c} \right)^2 \cdot \text{Efficiency} \cdot (\text{Ant}_x)^2 \right]$$

$$G_r(0.55) = 19.634 \quad \text{dB}$$

Need to operate with the antenna  
 off boresight, so subtract 1dB.

$$G_{\text{min}}(\text{Diameter}) := G_r(\text{Diameter}) - 1$$



## Now Calculate the G/T of the Terminal for a Specific Noise Figure

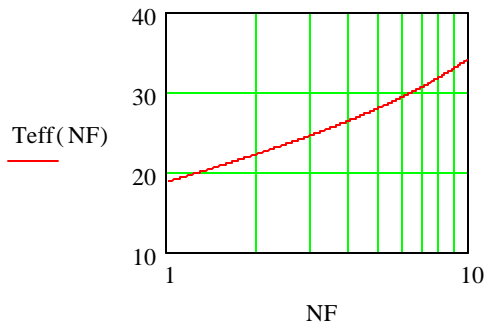
Calculate the G/T of the terminal as  $G/T = (G(\text{dB}) - 1) - 10 \log(T(\text{Kelvin}))$ , Noise Figure is in dBs, Teff is kelvin.

$$\text{Teff}(\text{Noisefigure}) := 10 \log \left[ \left( \frac{\text{Noisefigure}}{10} - 1 \right) \cdot 290 \right]$$

**Teff(2.5) = 23.535**

$$\text{GTc}(\text{diameter}, \text{Noisefigure}) := (\text{Gmin}(\text{diameter}) - 1) - \text{Teff}(\text{Noisefigure})$$

$$\text{GTr}(x, \text{Noisefigure}) := (\text{Gmin}(x) - 1) - \text{Teff}(\text{Noisefigure})$$



**(dB/k) G/T of rectangular antenna system**

**GTr(0.6, 2) = -3.905**

**(dB/k) G/T of circular antenna system**

**GTc(0.6, 2) = -4.955**

