

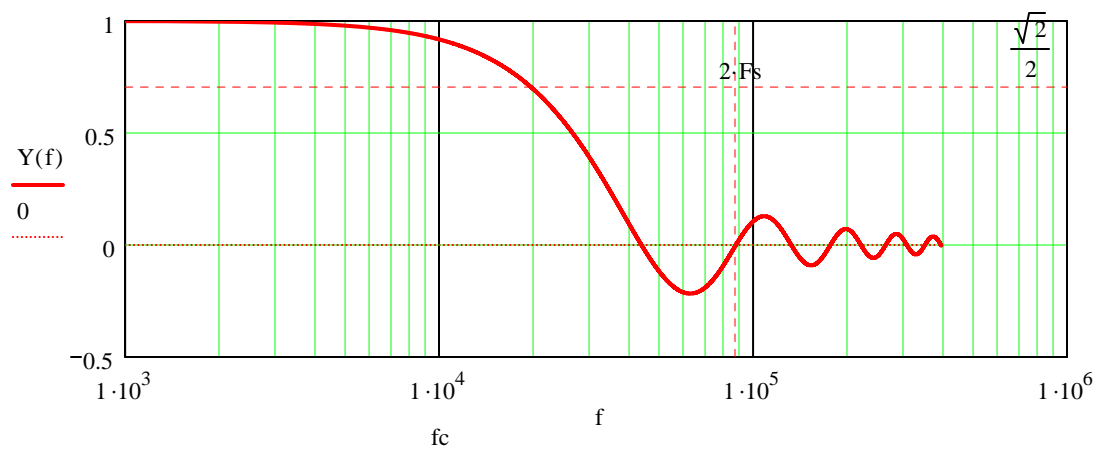
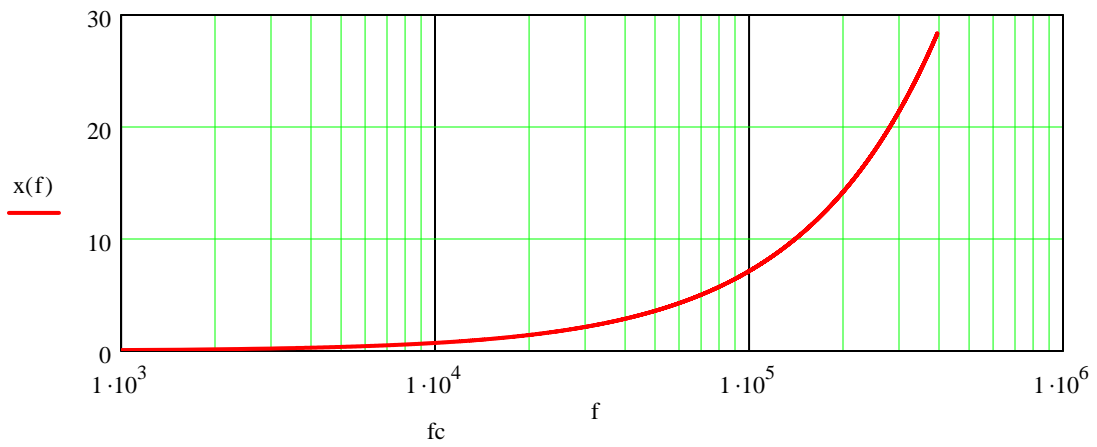
Sin (x)/x

$$F_s := 1 \cdot 44100$$

$$f := 1000, 1010 \dots 10^{5.6}$$

$$x(f) := \pi \cdot \left( \frac{f}{F_s} \right)$$

$$Y(f) := \frac{\sin(x(f))}{x(f)}$$



## Digital images

$f_{out} := 20000$

$bit := 16$

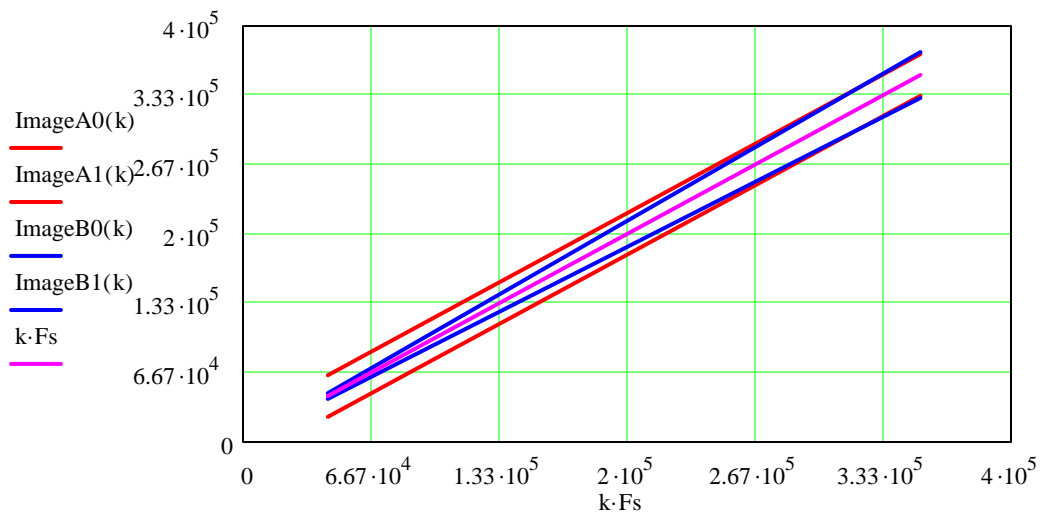
$k := 1 \dots 8$

$ImageA0(k) := k \cdot Fs - f_{out}$

$ImageA1(k) := k \cdot Fs + f_{out}$

$ImageB0(k) := \left\lfloor \frac{(bit - 1)}{bit} \right\rfloor \cdot (k \cdot Fs)$

$ImageB1(k) := \left\lceil \frac{(bit + 1)}{bit} \right\rceil \cdot (k \cdot Fs)$



$ImageA0(k) =$	$ImageA1(k) =$	$ImageB0(k) =$	$ImageB1(k) =$	$k \cdot Fs =$
$2.41 \cdot 10^4$	$6.41 \cdot 10^4$	$4.134 \cdot 10^4$	$4.686 \cdot 10^4$	$4.41 \cdot 10^4$
$6.82 \cdot 10^4$	$1.082 \cdot 10^5$	$8.269 \cdot 10^4$	$9.371 \cdot 10^4$	$8.82 \cdot 10^4$
$1.123 \cdot 10^5$	$1.523 \cdot 10^5$	$1.24 \cdot 10^5$	$1.406 \cdot 10^5$	$1.323 \cdot 10^5$
$1.564 \cdot 10^5$	$1.964 \cdot 10^5$	$1.654 \cdot 10^5$	$1.874 \cdot 10^5$	$1.764 \cdot 10^5$
$2.005 \cdot 10^5$	$2.405 \cdot 10^5$	$2.067 \cdot 10^5$	$2.343 \cdot 10^5$	$2.205 \cdot 10^5$
$2.446 \cdot 10^5$	$2.846 \cdot 10^5$	$2.481 \cdot 10^5$	$2.811 \cdot 10^5$	$2.646 \cdot 10^5$
$2.887 \cdot 10^5$	$3.287 \cdot 10^5$	$2.894 \cdot 10^5$	$3.28 \cdot 10^5$	$3.087 \cdot 10^5$
$3.328 \cdot 10^5$	$3.728 \cdot 10^5$	$3.308 \cdot 10^5$	$3.748 \cdot 10^5$	$3.528 \cdot 10^5$

## Sin (x)/x transfer representation

$$\text{Adb}(f) := 20 \cdot \log \left[ \left( \frac{f_{\text{out}}}{f} \right) \cdot \left( \frac{\sin \left( \frac{\pi \cdot f}{F_s} \right)}{\sin \left( \frac{\pi \cdot f_{\text{out}}}{F_s} \right)} \right) \right]$$

$$a(k) := k \cdot F_s + \frac{F_s}{2}$$

$$f_{\text{out}} = 2 \times 10^4$$

$$\text{Adb}(1000) = 3.16$$

$$a1 := \text{ImageA0}(1)$$

$$\text{Adb}(f_{\text{out}}) = 0$$

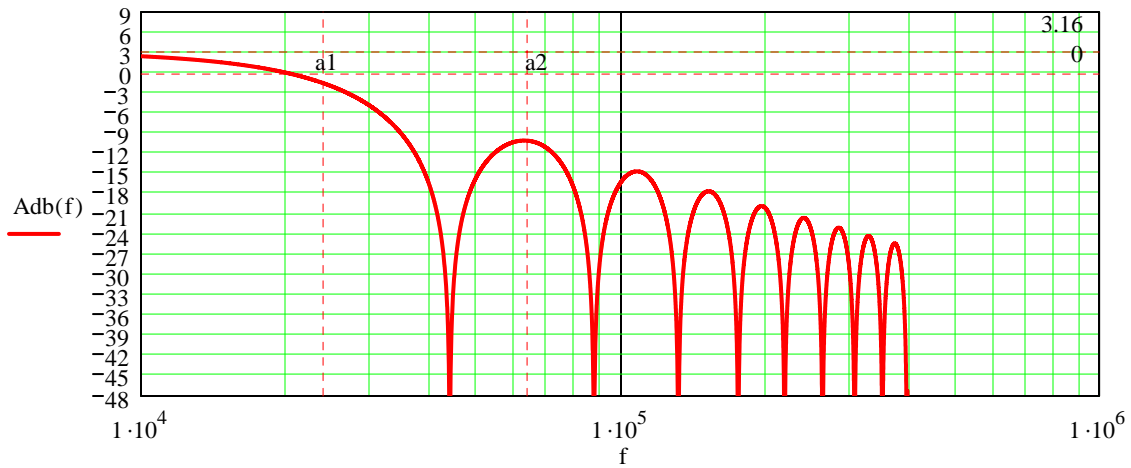
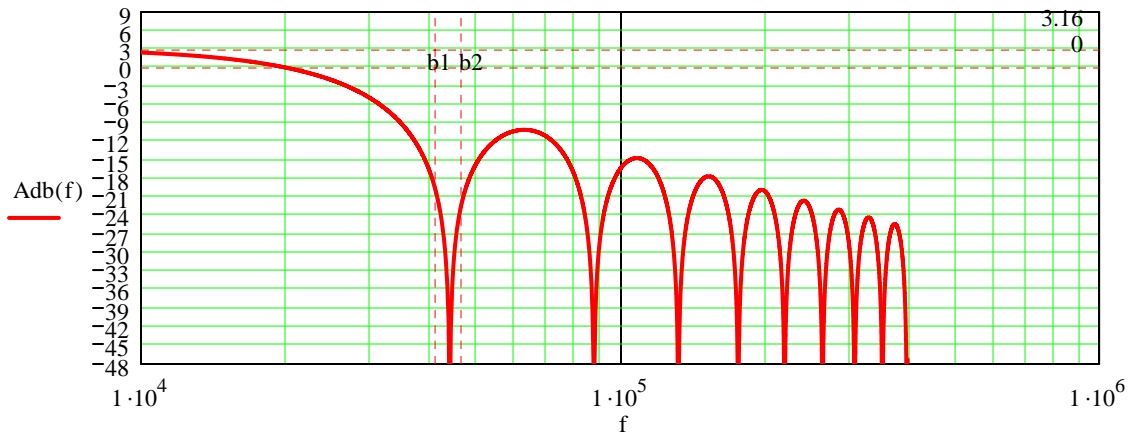
$$a2 := \text{ImageA1}(1)$$

$$\text{Adb} \left( \frac{F_s}{2} \right) - \text{Adb}(1000) = -3.915$$

$$b1 := \text{ImageB0}(1)$$

$$\text{Adb}(f_{\text{out}}) - \text{Adb}(1000) = -3.16$$

$$b2 := \text{ImageB1}(1)$$



$$\begin{aligned} \text{Adb}(\text{ImageA0}(1)) - \text{Adb}(1000) &= -4.78 \\ \text{Adb}(\text{ImageA1}(1)) - \text{Adb}(1000) &= -13.277 \end{aligned}$$

$$10^{\left(\frac{-3.16}{20}\right)} = 0.695$$

$$\begin{aligned} \text{Adb}(\text{ImageA0}(8)) - \text{Adb}(1000) &= -27.583 \\ \text{Adb}(\text{ImageA1}(8)) - \text{Adb}(1000) &= -28.569 \end{aligned}$$

$$\begin{aligned} \text{Adb}(8264) &= 2.66 \\ \text{Adb}\left(\frac{F_s}{2}\right) &= -0.755 \end{aligned}$$

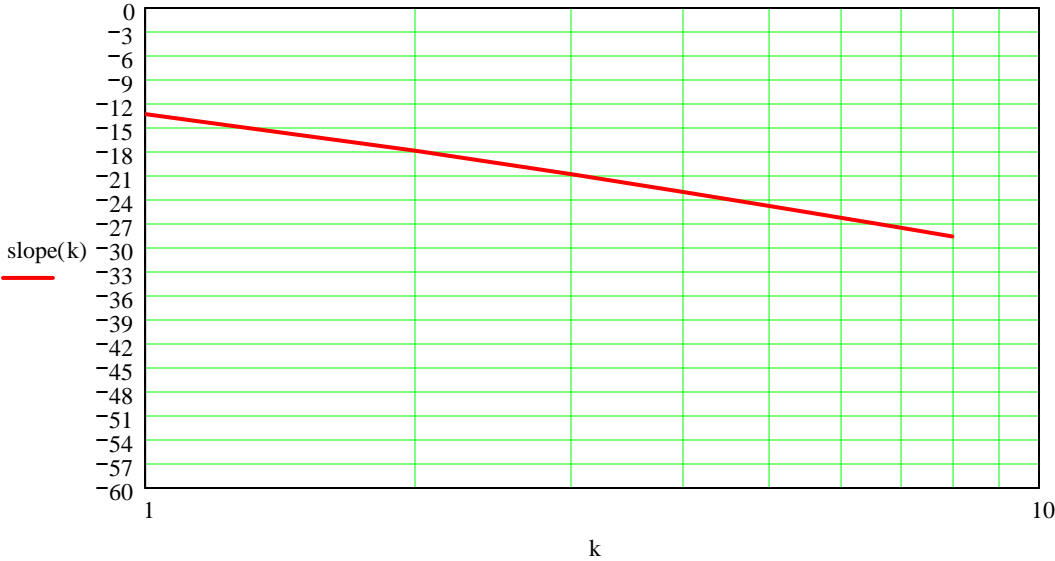
Fout points when images are equal for each n x Fs

$$(k \cdot F_s) \cdot \left[ 1 - \left[ \frac{(\text{bit} - 1)}{\text{bit}} \right] \right] = (k \cdot F_s) \cdot \left[ \left[ \frac{(\text{bit} + 1)}{\text{bit}} \right] - 1 \right] =$$

$2.756 \cdot 10^3$
$5.513 \cdot 10^3$
$8.269 \cdot 10^3$
$1.103 \cdot 10^4$
$1.378 \cdot 10^4$
$1.654 \cdot 10^4$
$1.929 \cdot 10^4$
$2.205 \cdot 10^4$

$2.756 \cdot 10^3$
$5.513 \cdot 10^3$
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$1.654 \cdot 10^4$
$1.929 \cdot 10^4$
$2.205 \cdot 10^4$

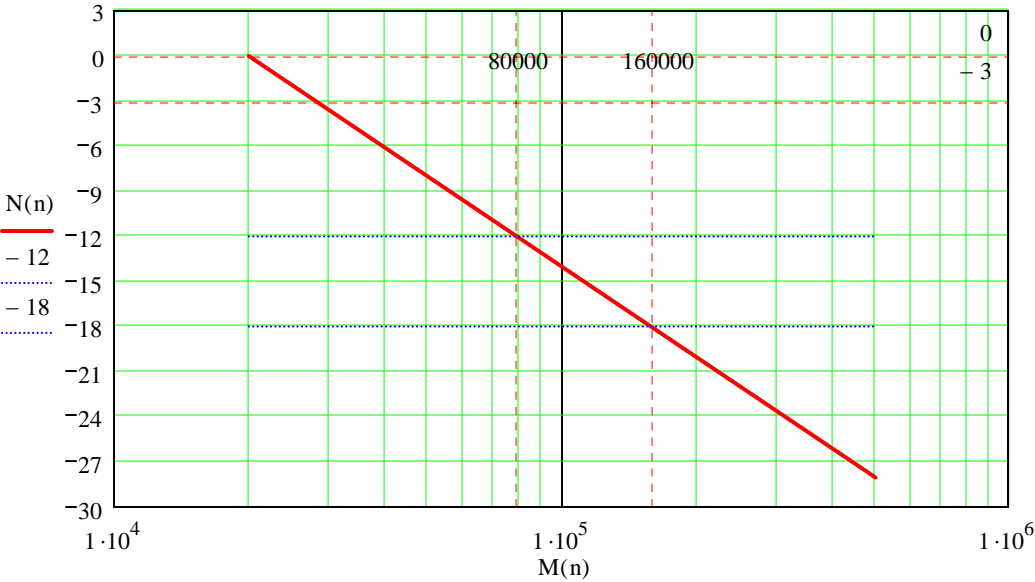
$$\text{slope}(k) := \text{Adb}(k \cdot F_s + f_{out}) - \text{Adb}(1000)$$



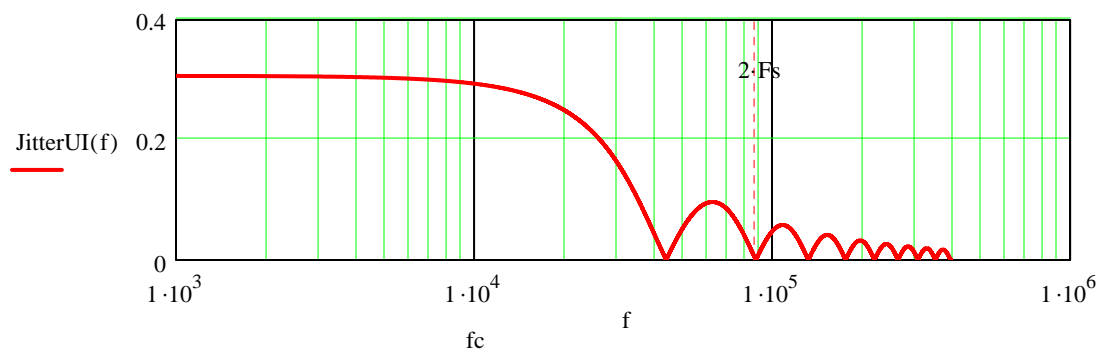
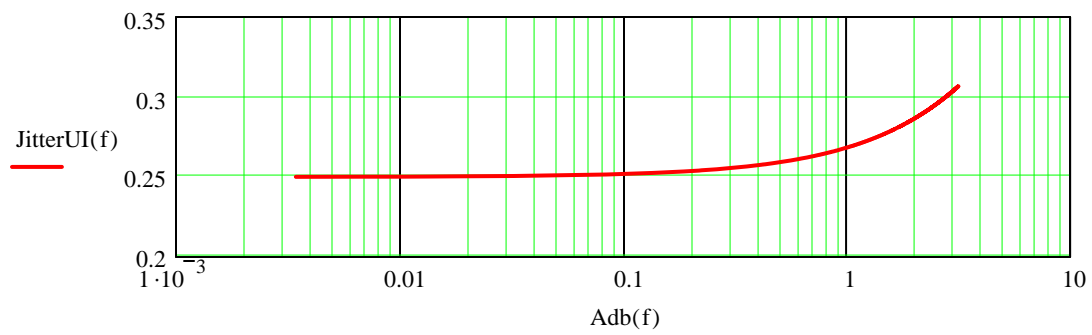
$$n := 0..11$$

$$M(n) := n \cdot F_s + f_{out}$$

$$N(n) := \text{Adb}(M(n))$$



$$\text{JitterUI}(f) := \left(\frac{1}{\pi}\right) \cdot \text{atan}\left[10^{\left(\frac{\text{Adb}(f)}{20}\right)}\right]$$



$f := 1000, 1000.01 \dots 1020$

$n := 1, 3 \dots 11$

$$\text{FIR}(f) := \sum_n \frac{\sin(n \cdot f)}{n} \quad 1.11111 \cdot \left(\frac{\sqrt{2}}{2}\right) = 0.786$$

