$T_{ум} := 0.01$ $T_ф := 0.1$ $K_{у2} := 3.5$

$k_{гп} := 1$ $\alpha := 0.4$ $T_1 := 0.5$

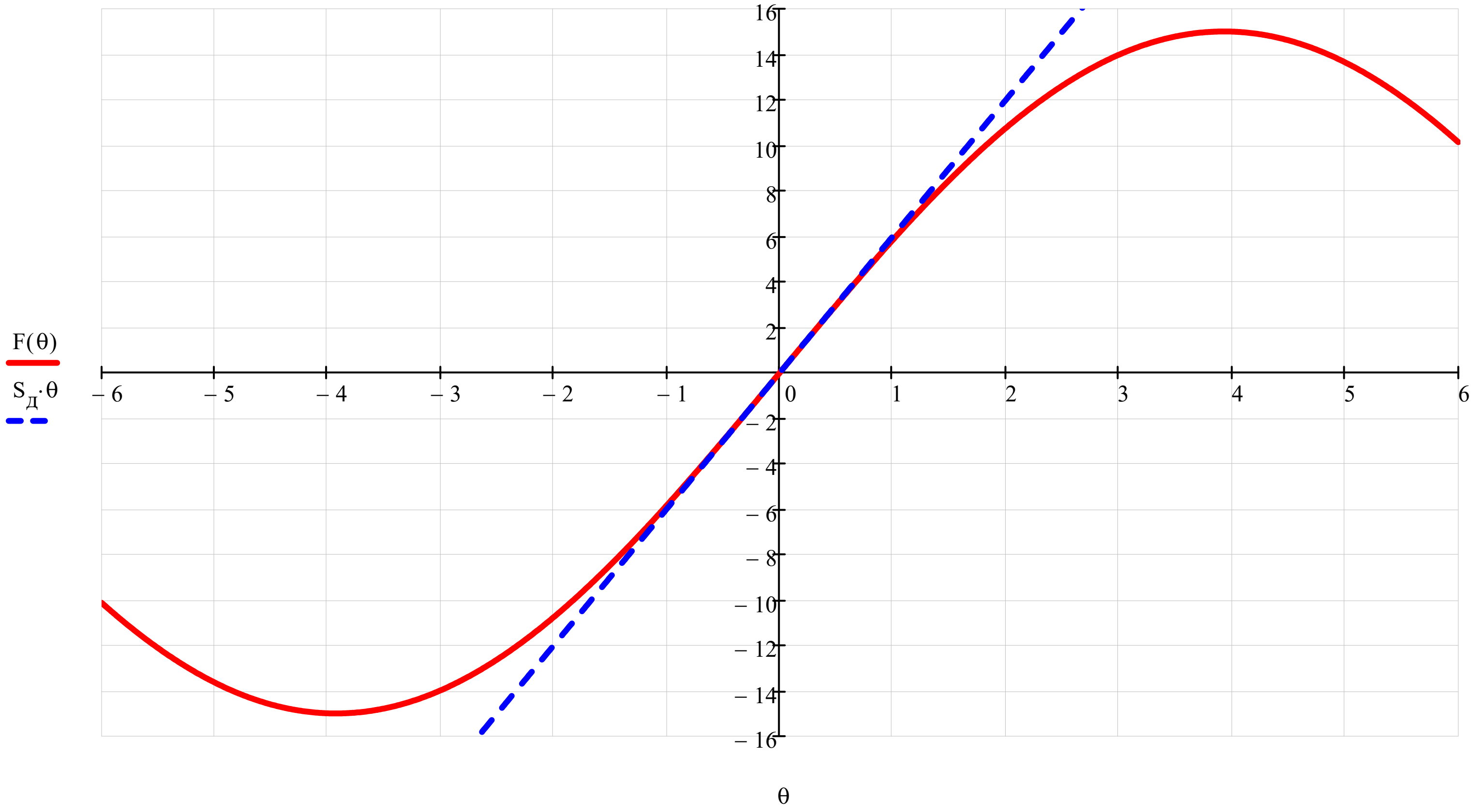
$A := 15$ $\beta := 0.4$ $V := 0$

$B := 7$ $K_{у1} := 3.5$ $a := 0.5$

$F(\theta) := A\cdot\sin(\alpha\cdot\theta)$

$S_д(\theta) := \frac{d}{d\theta}F(\theta) \rightarrow 6.0\cdot\cos(0.4\cdot\theta)$

$S_д := S_д(0) = 6$



$a_0 := S_д\cdot K_{у2}\cdot k_{гп} = 21$

$a_1 := S_д\cdot K_{у2}\cdot k_{гп}\cdot T_1 = 10.5$

$a_2 := 1$

$a_3 := T_{ум} = 0.01$

$a_1\cdot a_2 = 10.5$ $a_0\cdot a_3 = 0.21$

$$K_{\varphi\theta}(s) := \frac{s^2\cdot(s\cdot T_{ум} + 1)}{s^2\cdot(s\cdot T_{ум} + 1) + S_д\cdot K_{у2}\cdot k_{гп}(s\cdot T_1 + 1)}$$

$$\Phi(s) := \frac{V}{s^2} + \frac{a}{s^3}$$

$$\lim_{s \to 0} \left(s \cdot K_{\varphi\theta}(s) \cdot \Phi(s)\right) \rightarrow 0.023809523809523809524$$

$$\theta_{уст} := \frac{a}{S_д \cdot K_{y2} \cdot k_{гп}} = 0.024$$

$$a_3 := T_{ум}$$

$$a_2 := 1 \qquad b_2 := 0$$

$$a_1 := S_д \cdot K_{y2} \cdot k_{гп} \cdot T_1 \qquad b_1 := -K_{y2} \cdot k_{гп} \cdot T_1$$

$$a_0 := S_д \cdot K_{y2} \cdot k_{гп} \qquad b_0 := -K_{y2} \cdot k_{гп}$$

$$J_3 := \frac{b_2^{\,2} \cdot a_0 \cdot a_1 + \left(b_1^{\,2} - 2 \cdot b_0 \cdot b_2\right) \cdot a_0 \cdot a_3 + b_0^{\,2} \cdot a_2 \cdot a_3}{2 \cdot a_0 \cdot a_3 \cdot \left(a_1 \cdot a_2 - a_0 \cdot a_3\right)} = 0.177$$

$$\frac{0^2 \cdot S_д \cdot K_{y2} \cdot k_{гп} \cdot S_д \cdot K_{y2} \cdot k_{гп} \cdot T_1 + \left[\left(-K_{y2} \cdot k_{гп} \cdot T_1\right)^2 - 2 \cdot \left(-K_{y2} \cdot k_{гп}\right) \cdot 0\right] \cdot S_д \cdot K_{y2} \cdot k_{гп} \cdot T_{ум} + \left(-K_{y2} \cdot k_{гп}\right)^2 \cdot T_{ум}}{2 \cdot S_д \cdot K_{y2} \cdot k_{гп} \cdot T_{ум} \cdot \left(S_д \cdot K_{y2} \cdot k_{гп} \cdot T_1 - S_д \cdot K_{y2} \cdot k_{гп} \cdot T_{ум}\right)} = 0.177$$

$$\frac{\left(-K_{y2} \cdot k_{гп} \cdot T_1\right)^2 \cdot S_д \cdot K_{y2} \cdot k_{гп} \cdot T_{ум} + \left(-K_{y2} \cdot k_{гп}\right)^2 \cdot T_{ум}}{2 \cdot S_д \cdot K_{y2} \cdot k_{гп} \cdot T_{ум} \cdot \left(S_д \cdot K_{y2} \cdot k_{гп} \cdot T_1 - S_д \cdot K_{y2} \cdot k_{гп} \cdot T_{ум}\right)} = 0.177$$

$$\frac{\left(T_1\right)^2 \cdot S_д \cdot K_{y2} \cdot k_{гп} + 1}{2 \cdot S_д \cdot \left(S_д \cdot T_1 - S_д \cdot T_{ум}\right)} = 0.177$$

$$\frac{\left(T_1\right)^2 \cdot S_д \cdot K_{y2} \cdot k_{гп} + 1}{2 \cdot S_д^{\,2} \cdot \left(T_1 - T_{ум}\right)} = 0.177$$

$$S_\xi := 10^{-4}$$

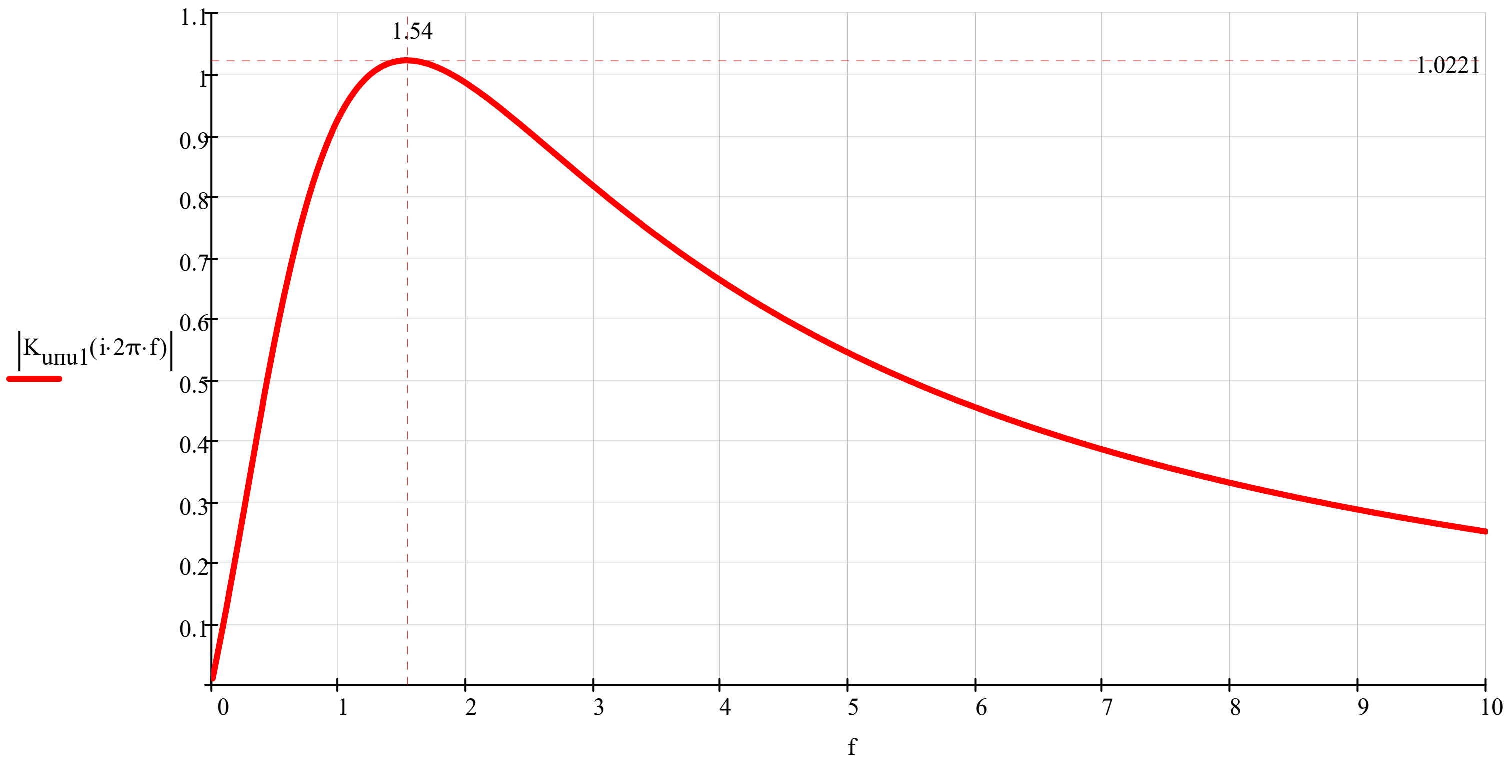
$$D_\theta := S_\xi \cdot J_3 = 1.772 \times 10^{-5}$$

$$\sigma_\theta := \sqrt{D_\theta} = 4.209 \times 10^{-3}$$

$$K_v(p) := K_{y2} \cdot \frac{p \cdot T_1 + 1}{p \cdot \left(p \cdot T_{ум} + 1\right)}$$

$$K_f(p) := \frac{1}{\left(p \cdot T_ф + 1\right)}$$

$$K_{упu1}(p) := \frac{K_v(p) \cdot K_f(p)}{1 + S_д \cdot K_v(p) \cdot \frac{k_{гп}}{p}}$$



1.54
1.0221
$|K_{uпu1}(i \cdot 2\pi \cdot f)|$
f
0
1
2
3
4
5
6
7
8
9
10
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
1.1