Рекурсивная Цепь Первого Порядка

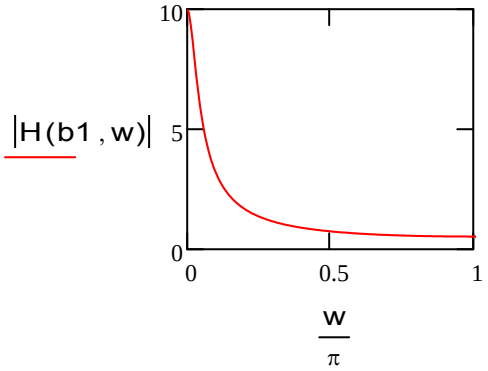
$b1 := 2$

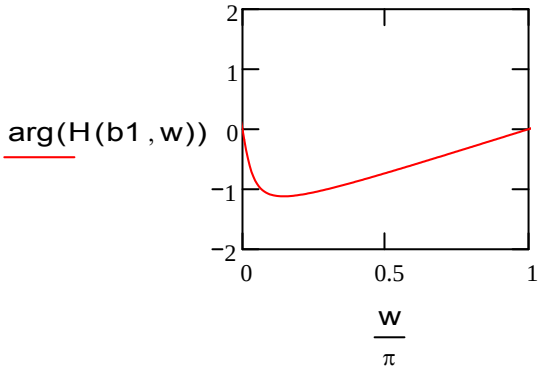
разностное уравнение для рекурсивной цепи первого порядка: $y(n) := x(n) - b1 \cdot y(n-1) \quad |b1| < 1$

частотная характеристика: $H(b1, w) := \frac{1}{1 + b1 \cdot \cos(w) - i \cdot b1 \cdot \sin(w)}$

АЧХ $|H(b1, w)|$ ФЧХ $\arg(H(b1, w))$ Частота_Среза $Wc(b) := \operatorname{acos}\left(\frac{b^2 - 4|b| + 1}{2b}\right)$

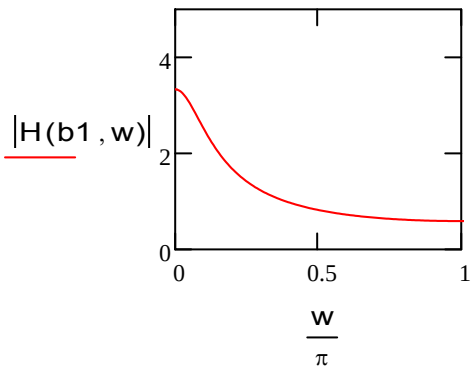
(1) $b1 := -0.9$

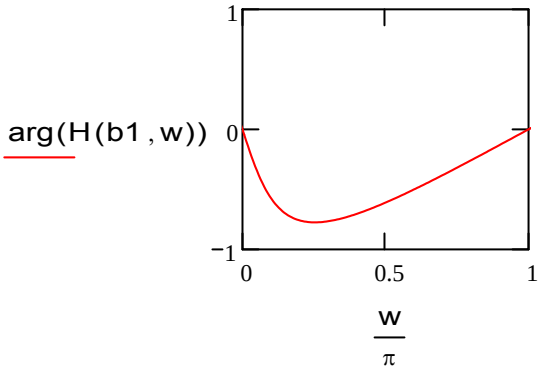




$Wc(b1) = 0.105$

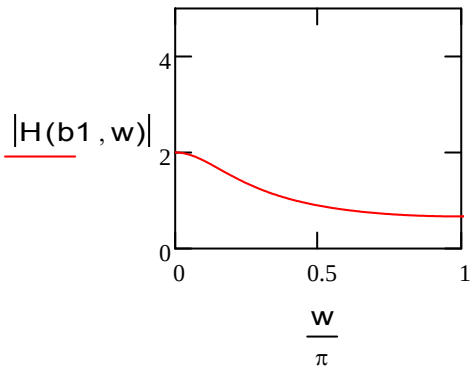
(2) $b1 := -0.7$

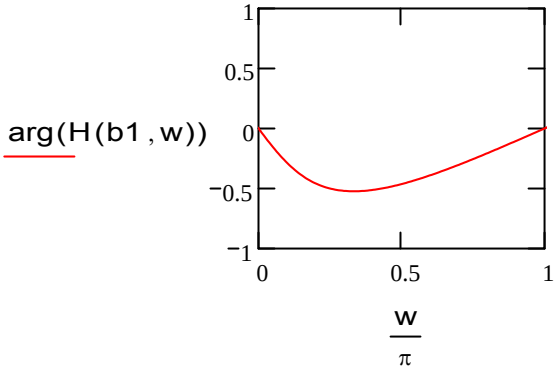




$Wc(b1) = 0.361$

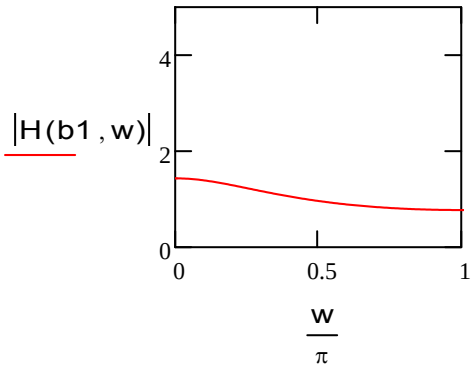
(3) $b1 := -0.5$

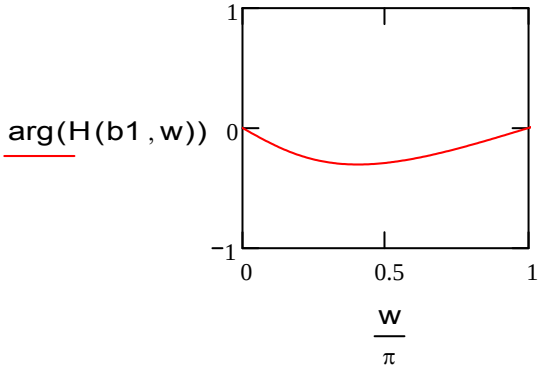




$Wc(b1) = 0.723$

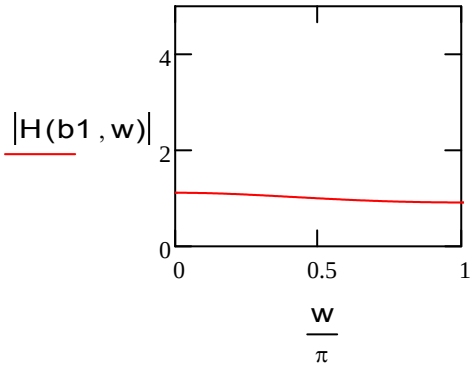
(4) $b1 := -0.3$

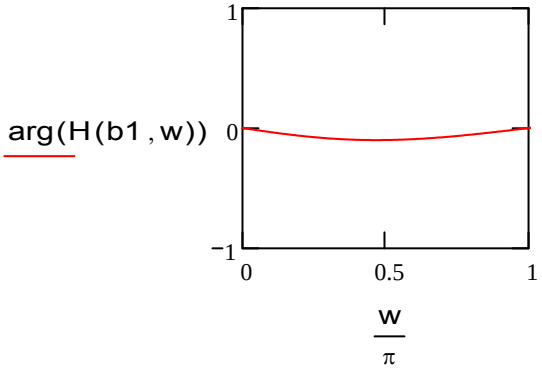




Wc(b1) = 1.386

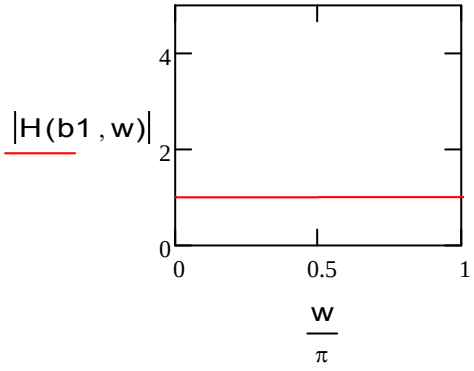
(5) $b1 := -0.1$

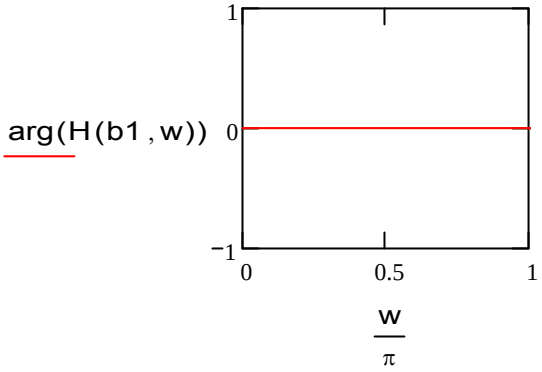




Wc(b1) = 3.142 − 1

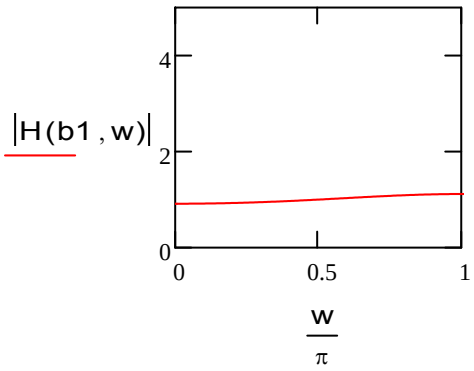
(6) $b1 := 0.0001$

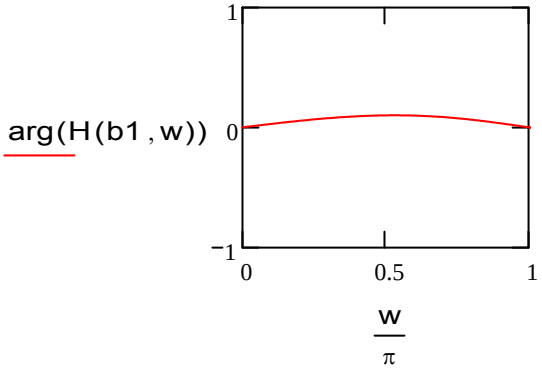




Wc(b1) = 9.21i

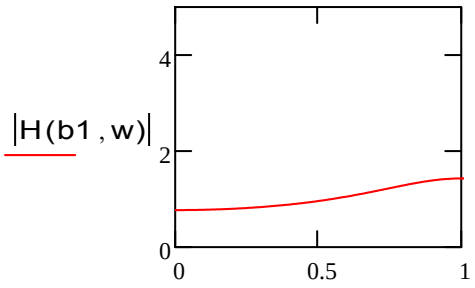
(7) $b1 := 0.1$

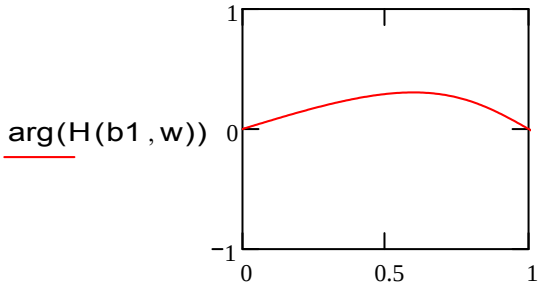




Wc(b1) = 1.78i

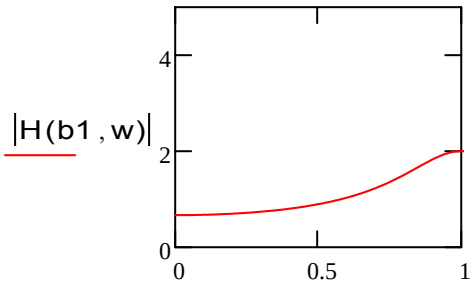
(8) $b1 := 0.3$

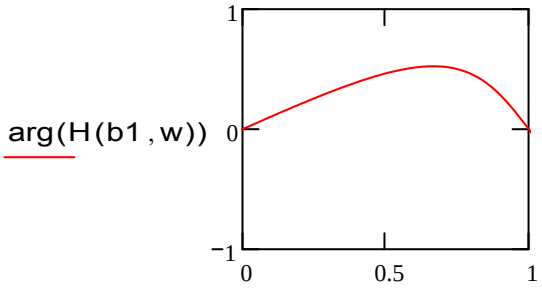




$Wc(b1) = 1.755$

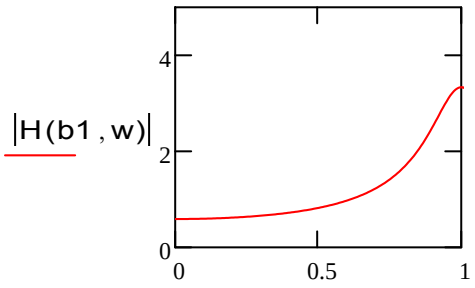
(9) $b1 := 0.5$

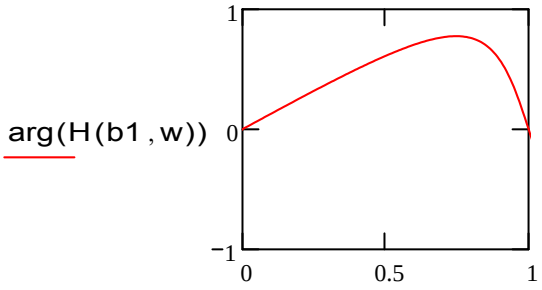




$Wc(b1) = 2.419$

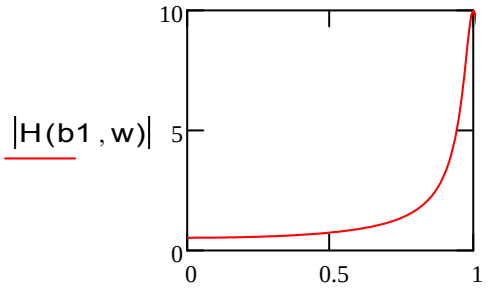
(10) $b1 := 0.7$

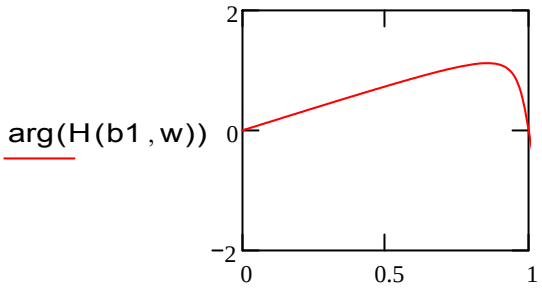




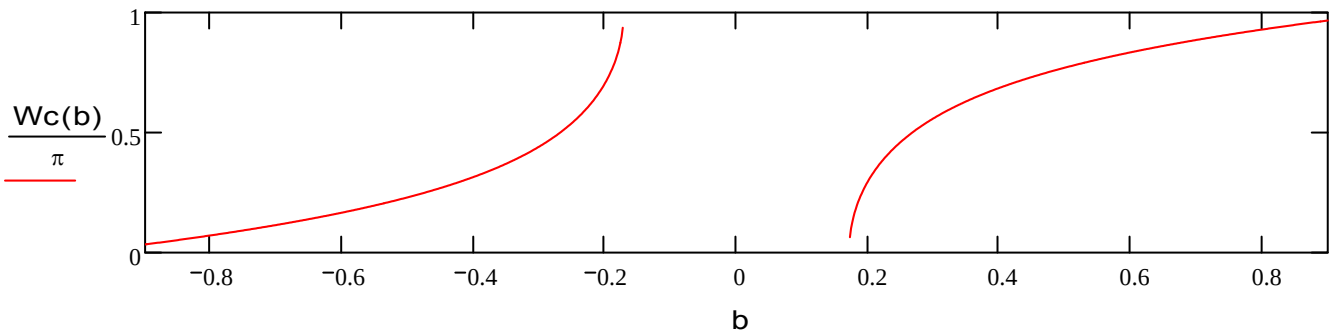
$Wc(b1) = 2.781$

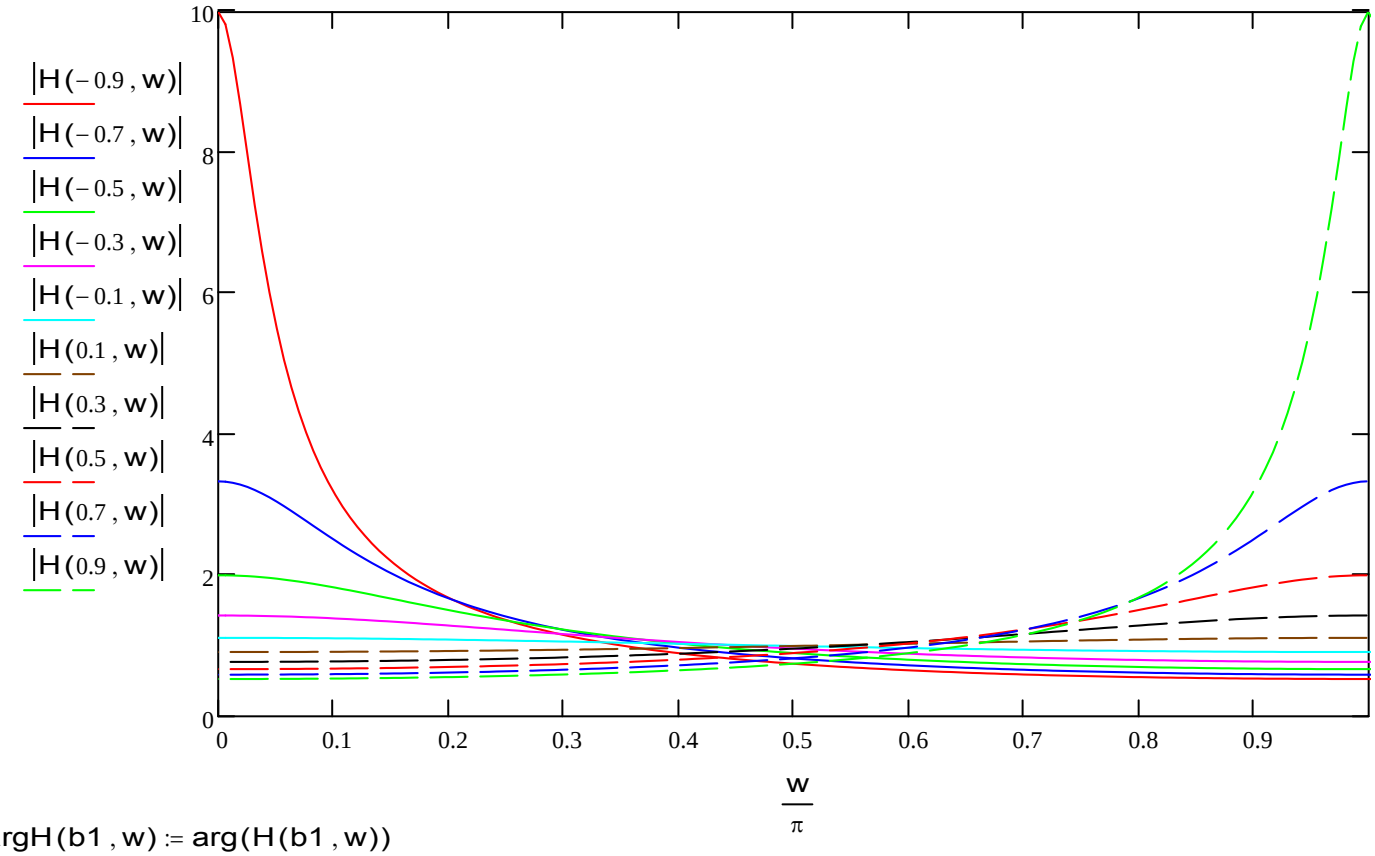
(11) $b1 := 0.9$



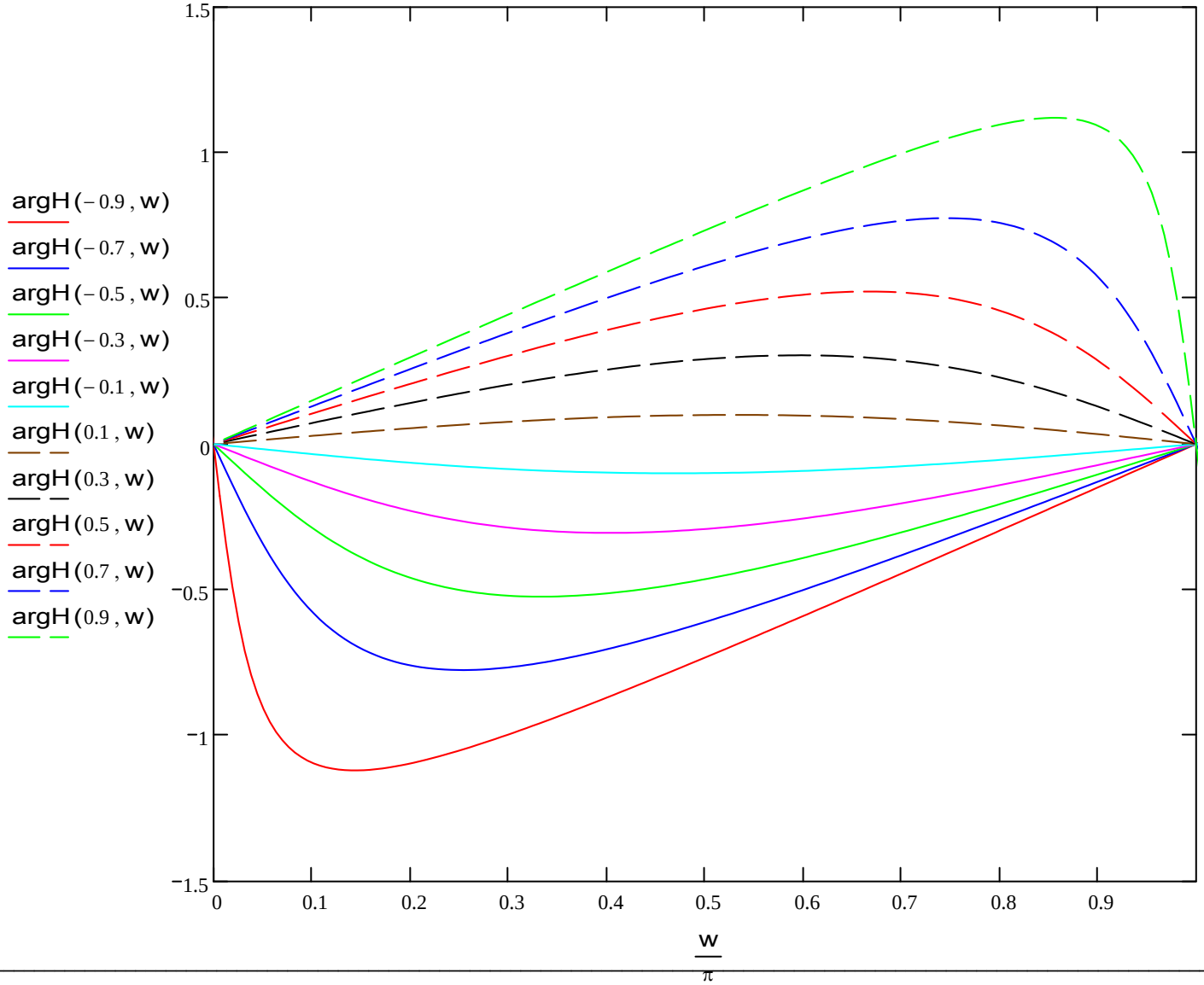


$Wc(b1) = 3.036$





argH(b1, w) := arg(H(b1, w))

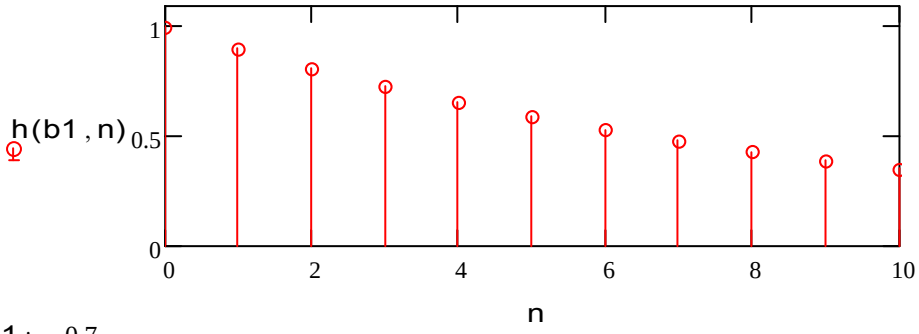


Импульсная Характеристика

$n := 0 .. 10$ $one(n) := 1$ $h(b1, n) := (-b1)^n \cdot one(n)$

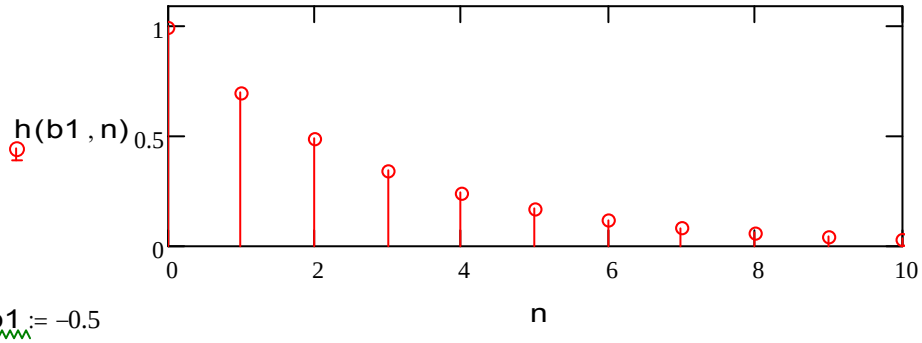
$opr(b1) :=$
$m \leftarrow 0$
while $|h(b1, m)| > 0.1$
$m \leftarrow m + 1$
$opr \leftarrow m$

$b1 := -0.9$



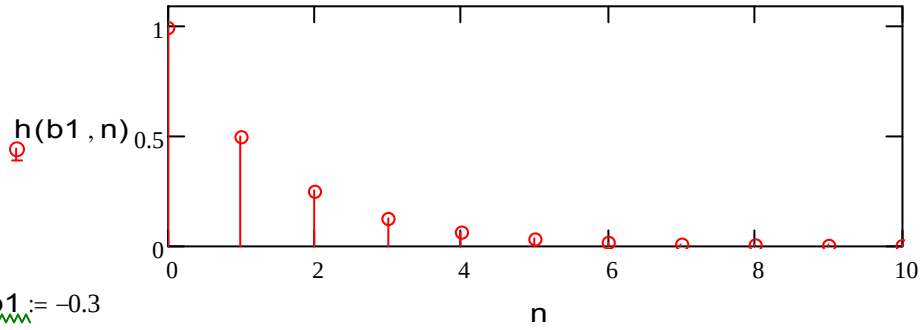
$opr(b1) = 22$

$b1 := -0.7$



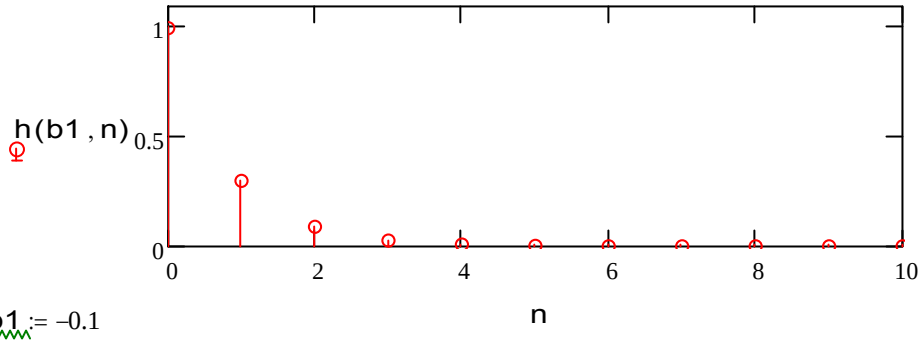
$opr(b1) = 7$

$b1 := -0.5$



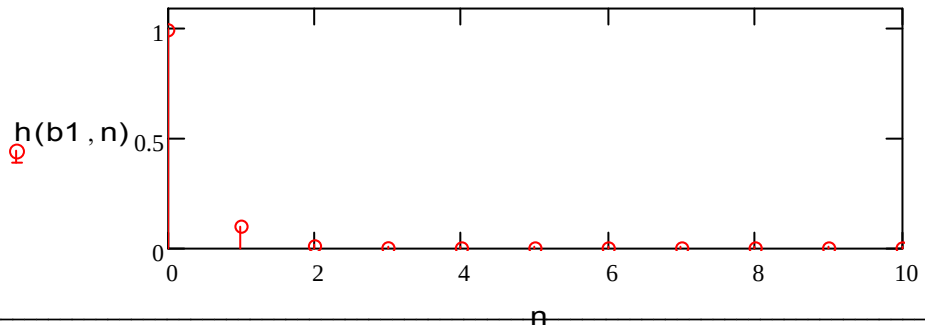
$opr(b1) = 4$

$b1 := -0.3$



$opr(b1) = 2$

$b1 := -0.1$



$opr(b1) = 1$

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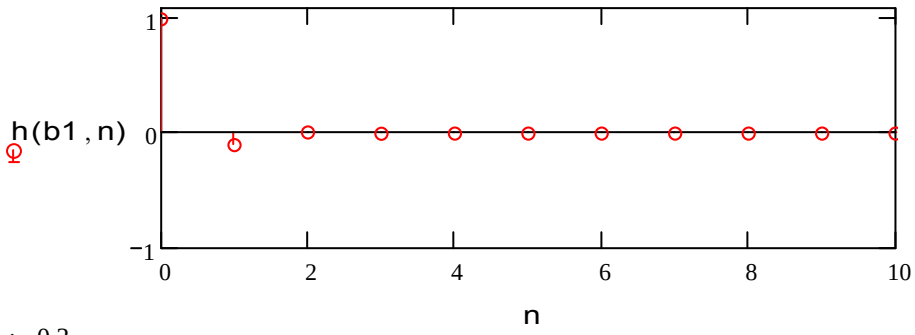
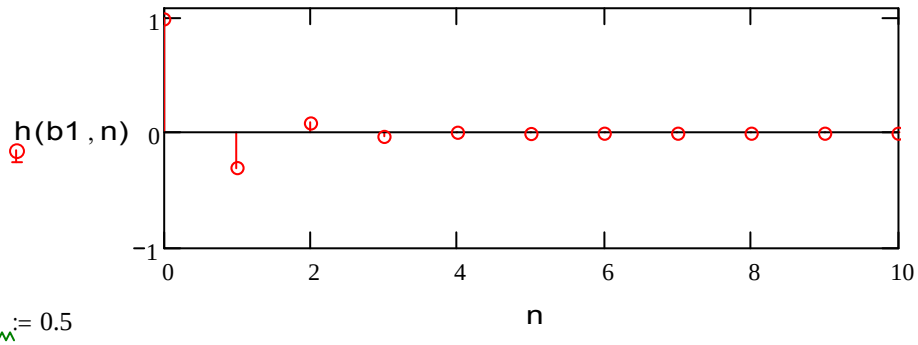
b1 := 0.1



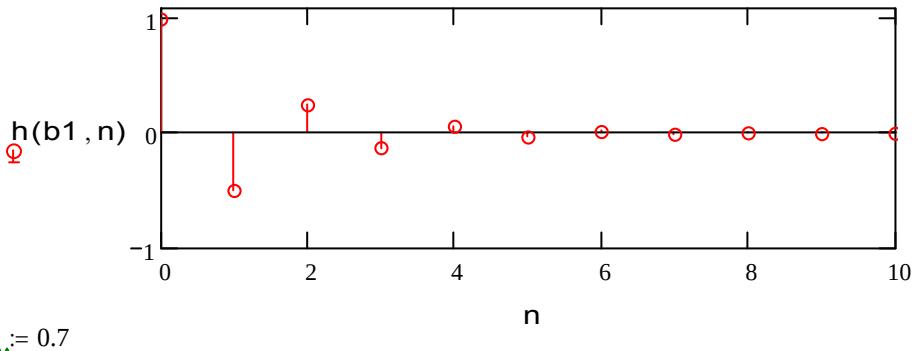
opr(b1) = 1

b1 := 0.3



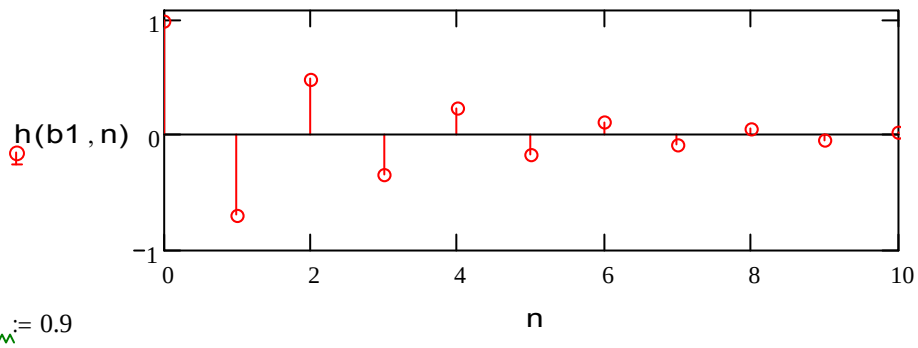
opr(b1) = 2

b1 := 0.5



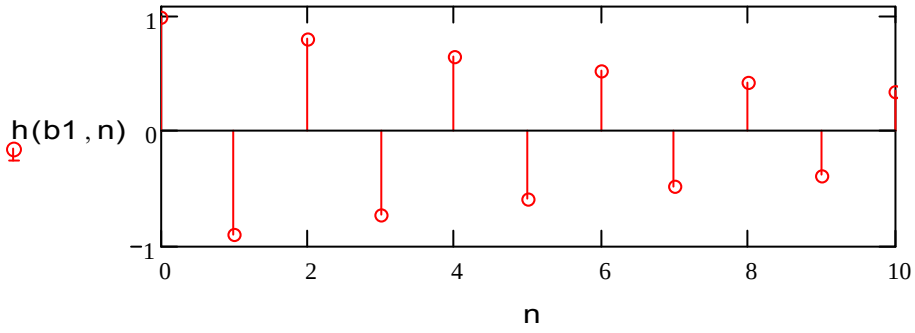
opr(b1) = 4

b1 := 0.7



opr(b1) = 7

b1 := 0.9



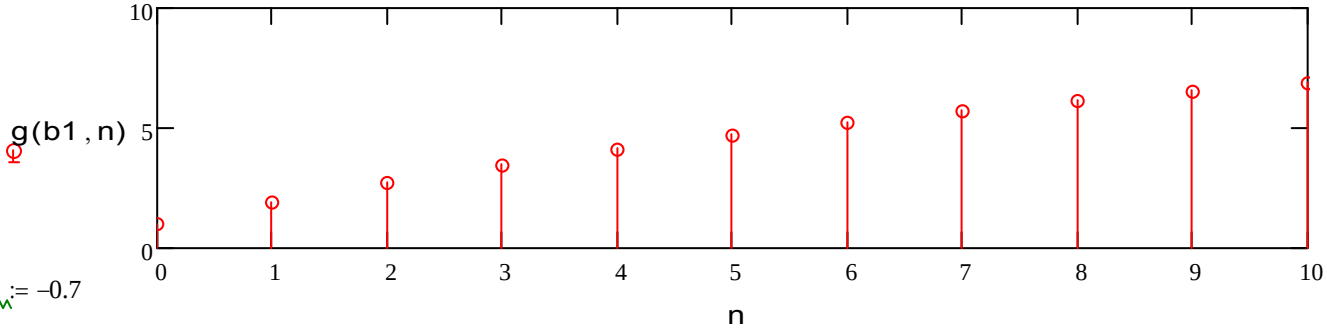
opr(b1) = 22

Переходная Характеристика

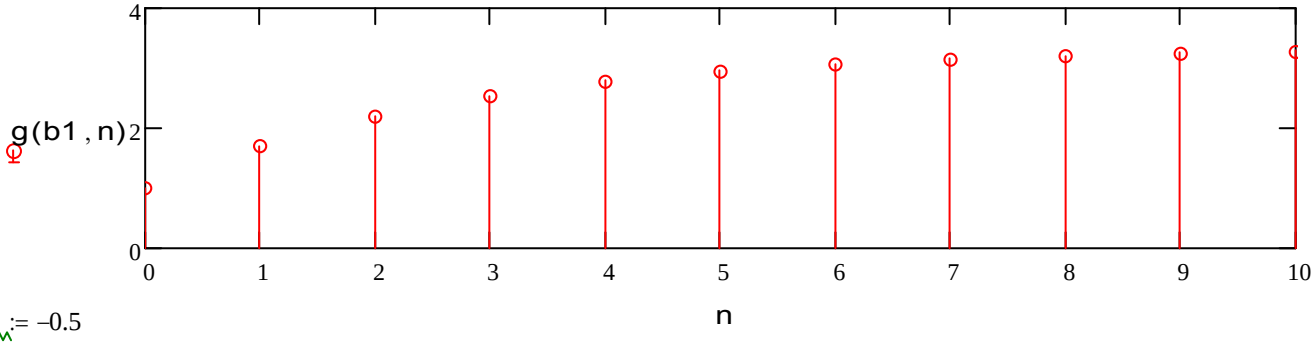
$n := 0 .. 10$

$$g(b1, n) := \frac{1 - (-b1)^{n+1}}{1 + b1}$$

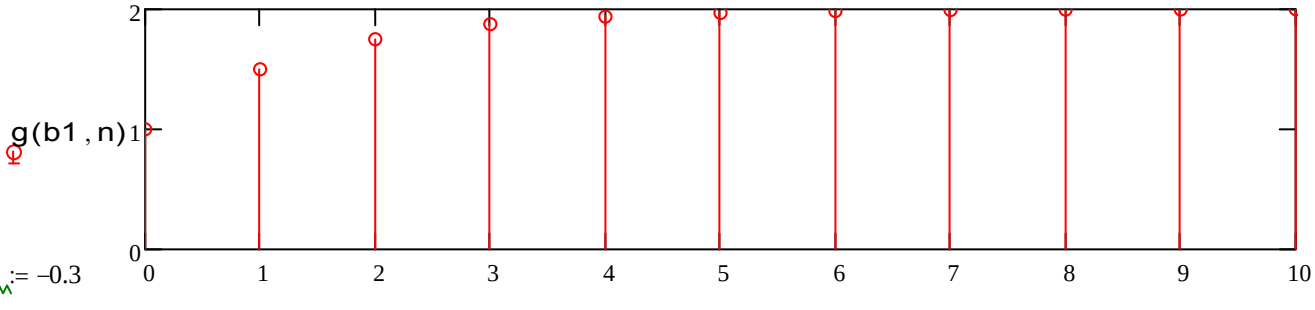
$b1 := -0.9$



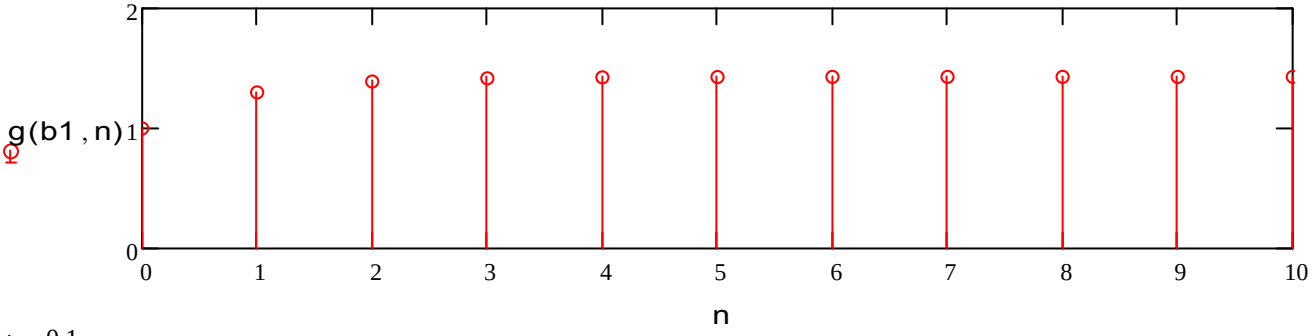
$b1 := -0.7$



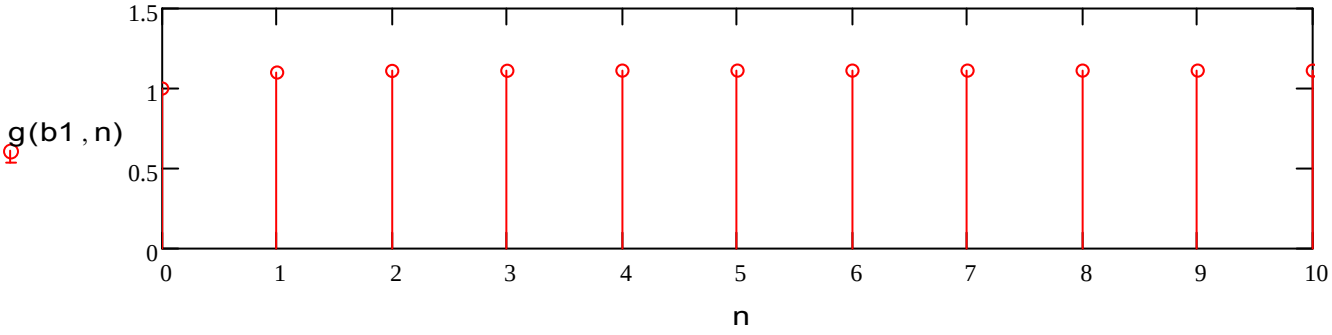
$b1 := -0.5$



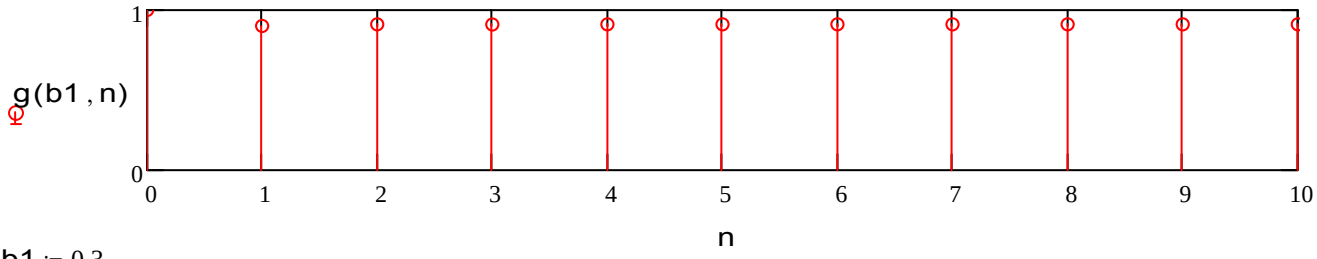
$b1 := -0.3$



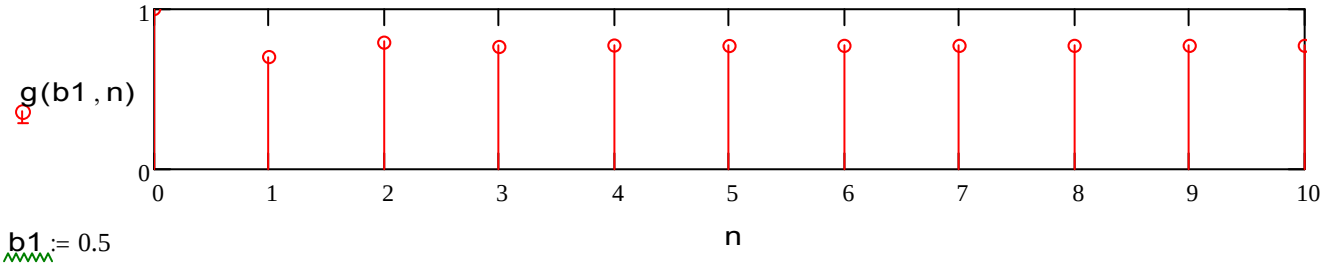
$b1 := -0.1$



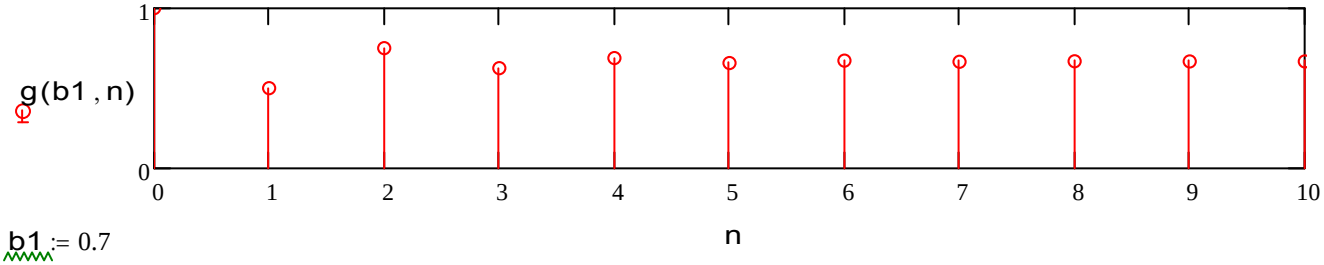
b1 := 0.1



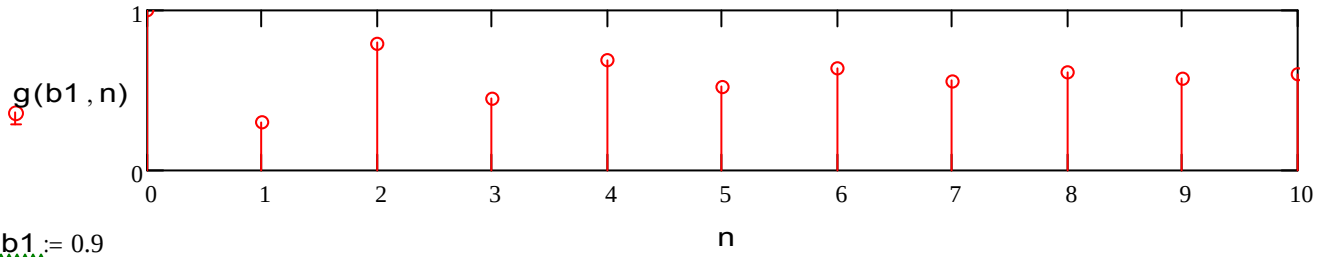
b1 := 0.3



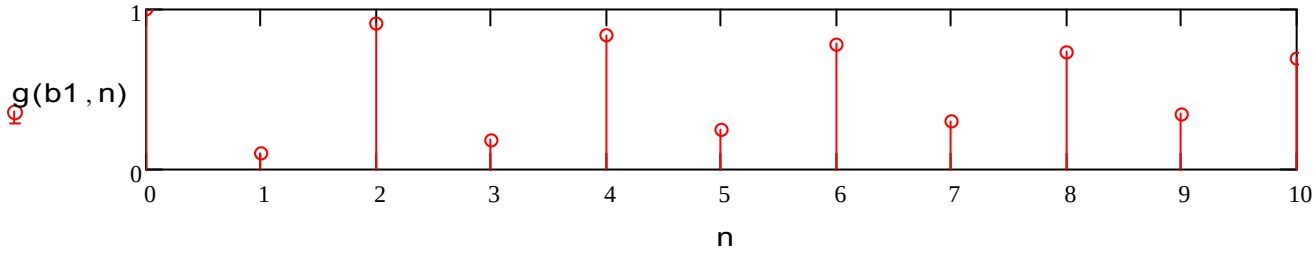
b1 := 0.5



b1 := 0.7



b1 := 0.9



Воздействие Прямоугольного Импульса

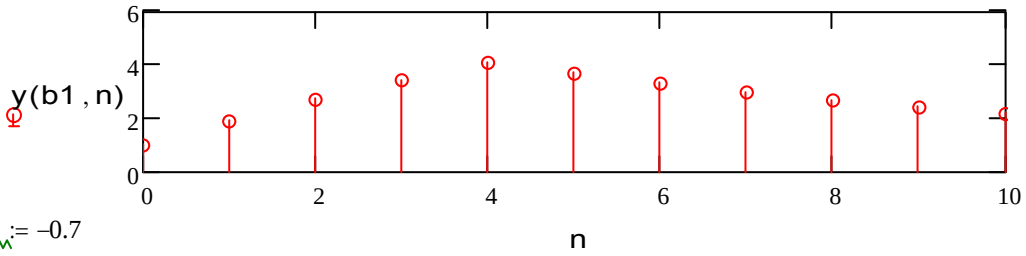
$$one(n, ni) := \begin{cases} 1 & \text{if } n \geq ni \\ 0 & \text{otherwise} \end{cases}$$

$ni := 5 \quad n := 0 .. 10$

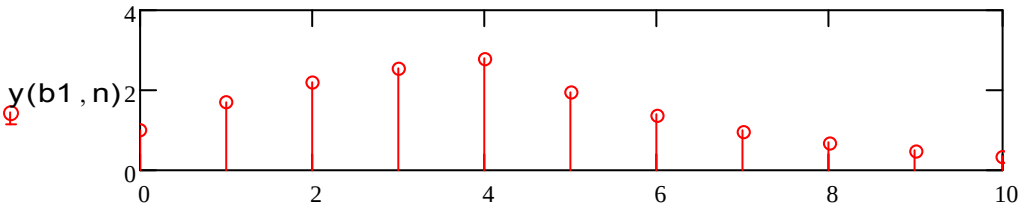
$$y1(b1, n) := \frac{1 - (-b1)^{n+1}}{1 + b1} \cdot one(n, 0) \qquad y2(b1, n) := \frac{1 - (-b1)^{n-ni+1}}{1 + b1} \cdot one(n, ni)$$

$$y(b1, n) := y1(b1, n) - y2(b1, n)$$

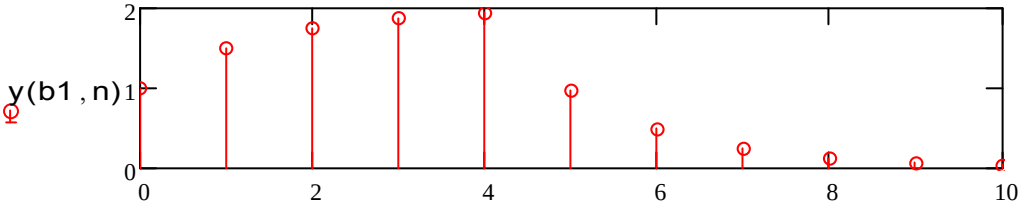
$b1 := -0.9$



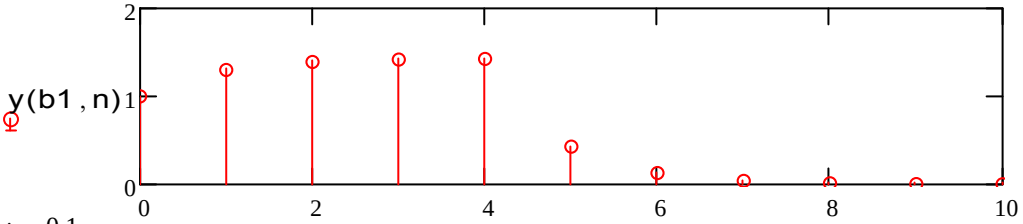
$b1 := -0.7$



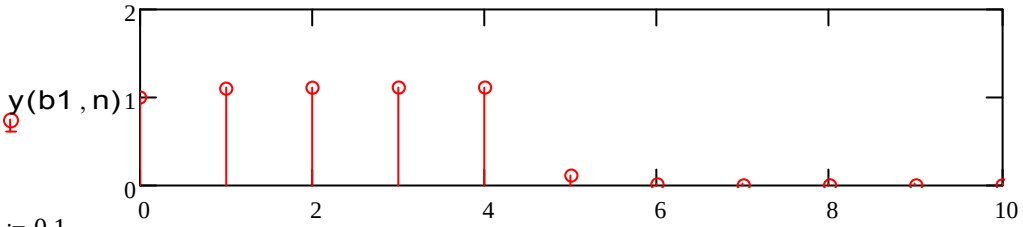
$b1 := -0.5$



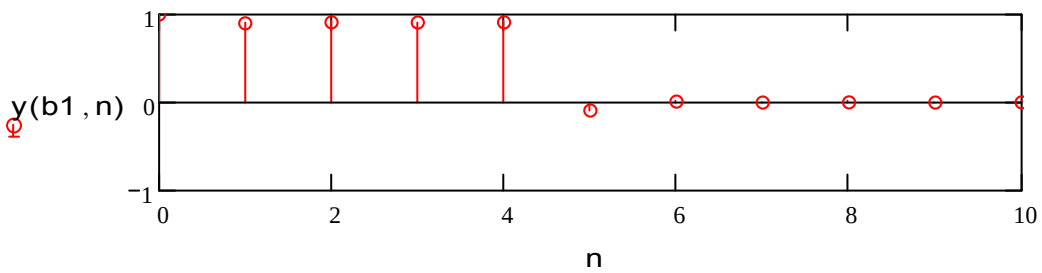
$b1 := -0.3$



$b1 := -0.1$



$b1 := 0.1$



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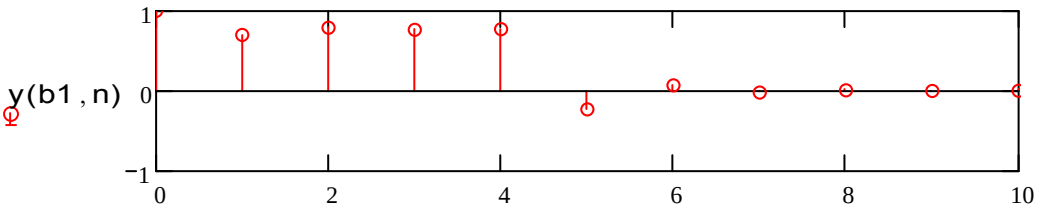
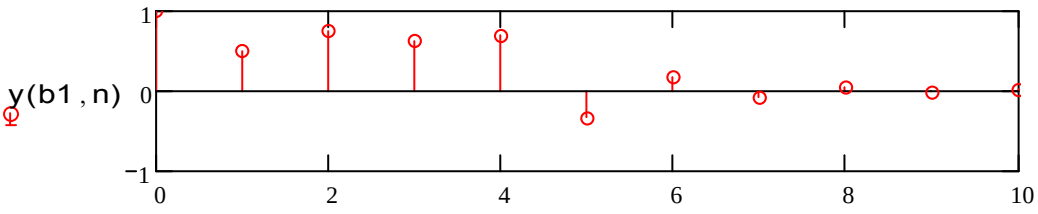
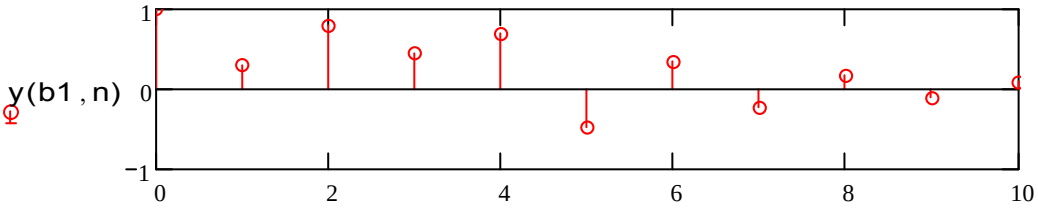
b1 := 0.3



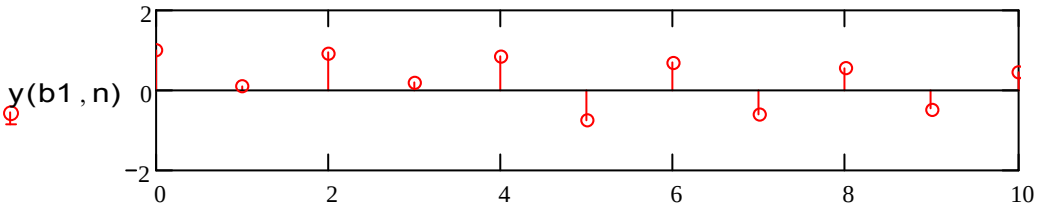
b1 := 0.5



b1 := 0.7



b1 := 0.9

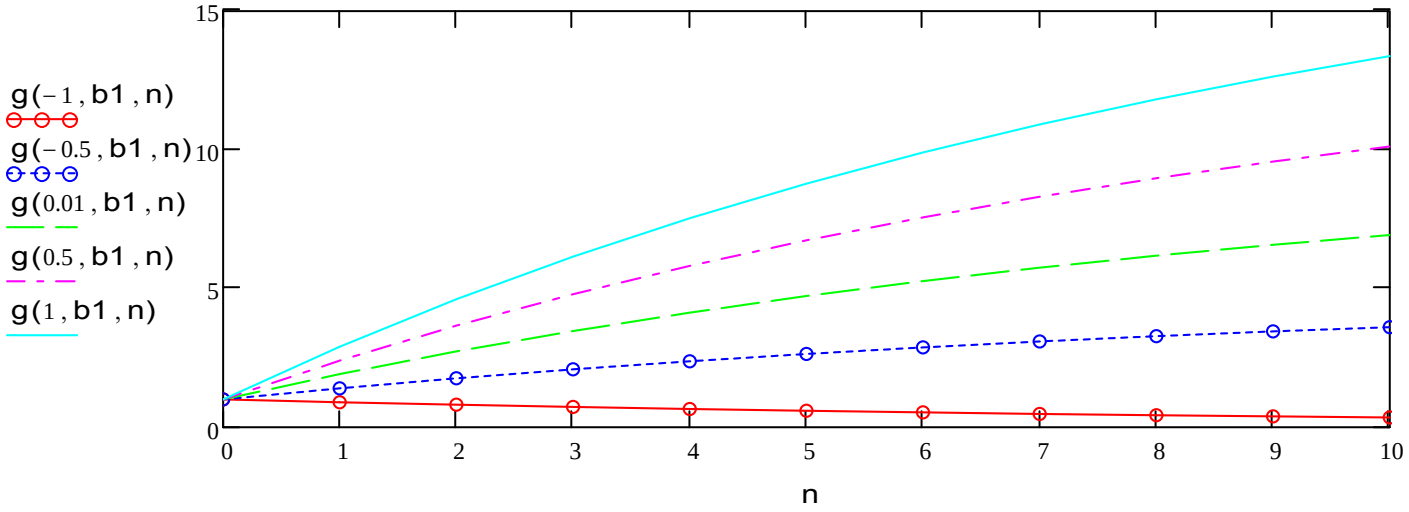


Переходная Характеристика

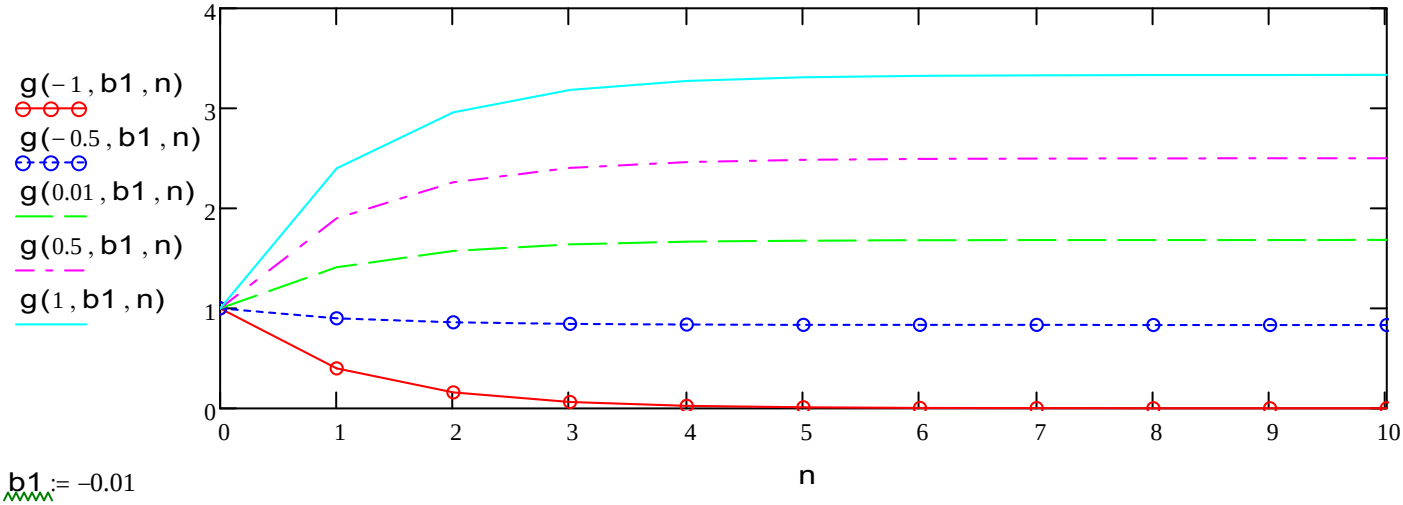
$n := 0 .. 10$

$$g(a1, b1, n) := \frac{1 + a1 - (a1 - b1)(-b1)^n}{1 + b1}$$

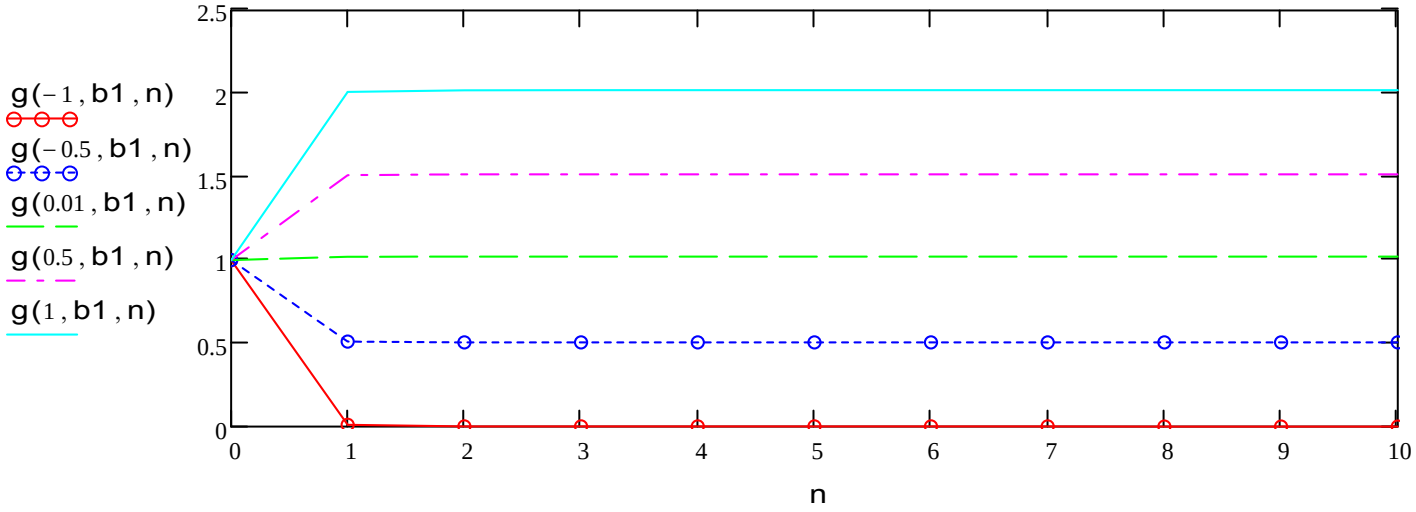
$b1 := -0.9$



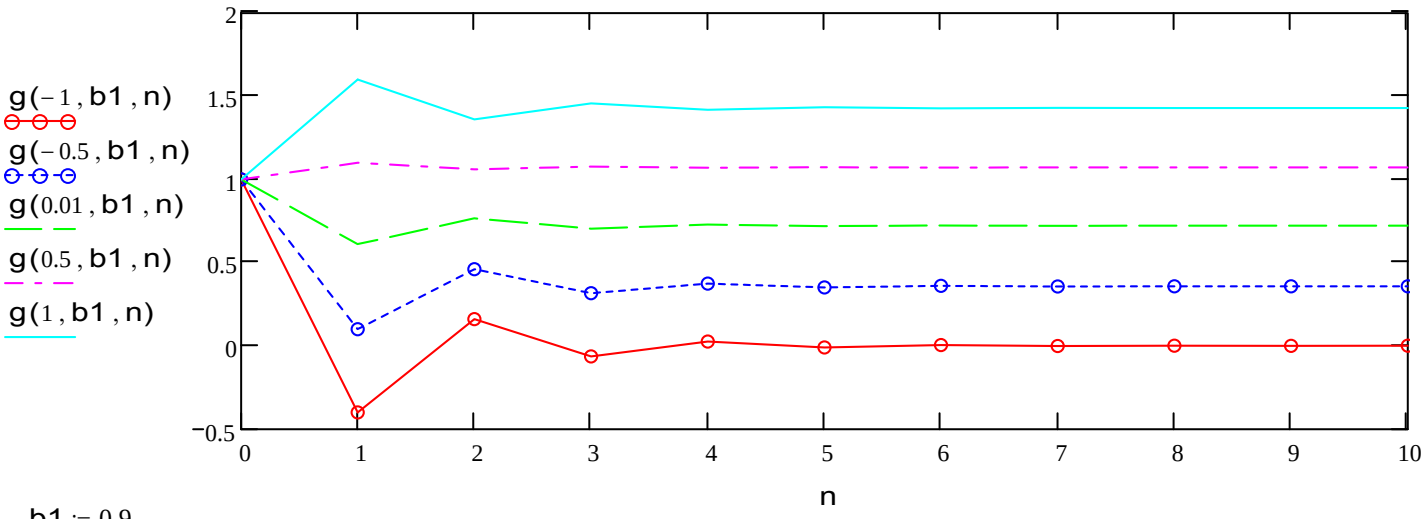
$b1 := -0.4$



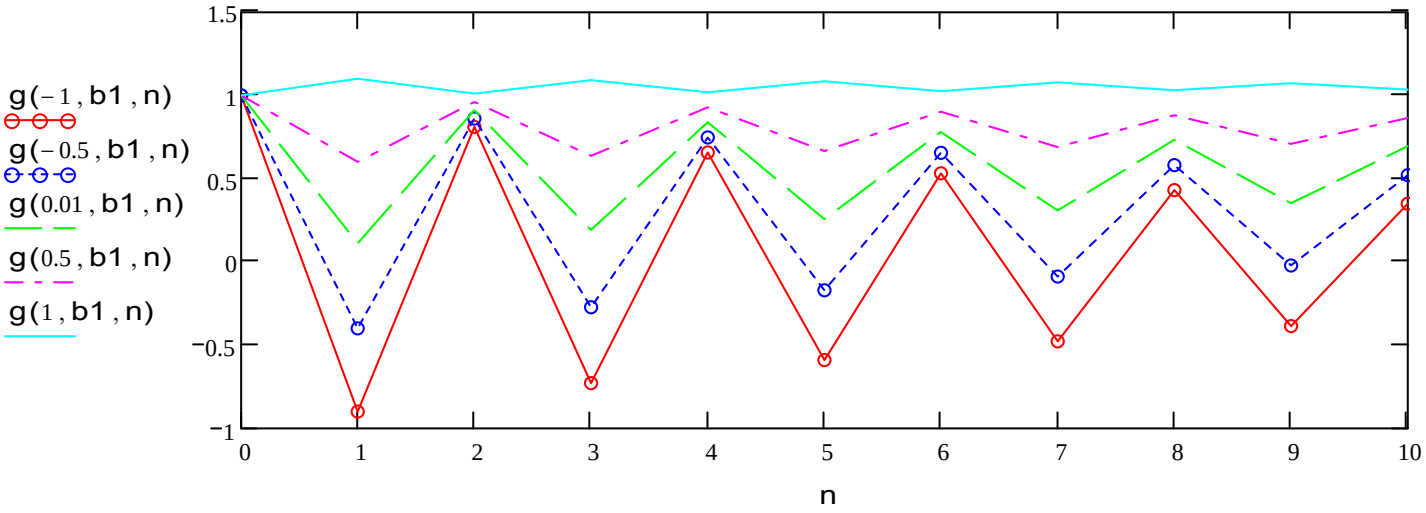
$b1 := -0.01$



b1 := 0.4



b1 := 0.9



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Воздействие Прямоугольного Импульса

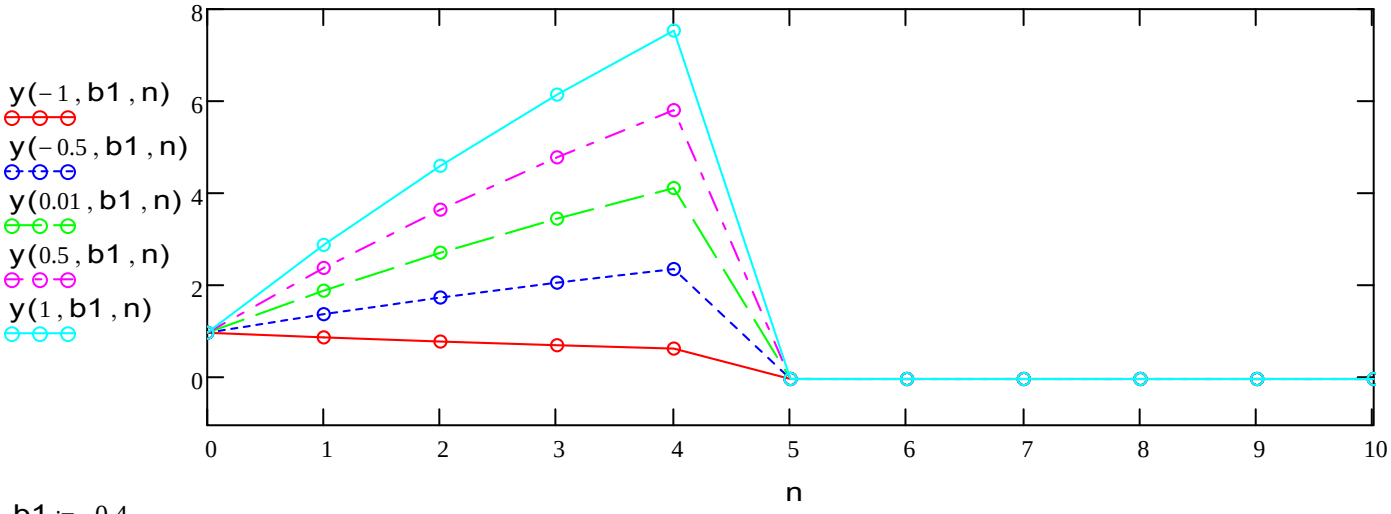
$$one(n, ni) := \begin{cases} 1 & \text{if } n \geq ni \\ 0 & \text{otherwise} \end{cases}$$

$ni := 5 \quad n := 0 .. 10$

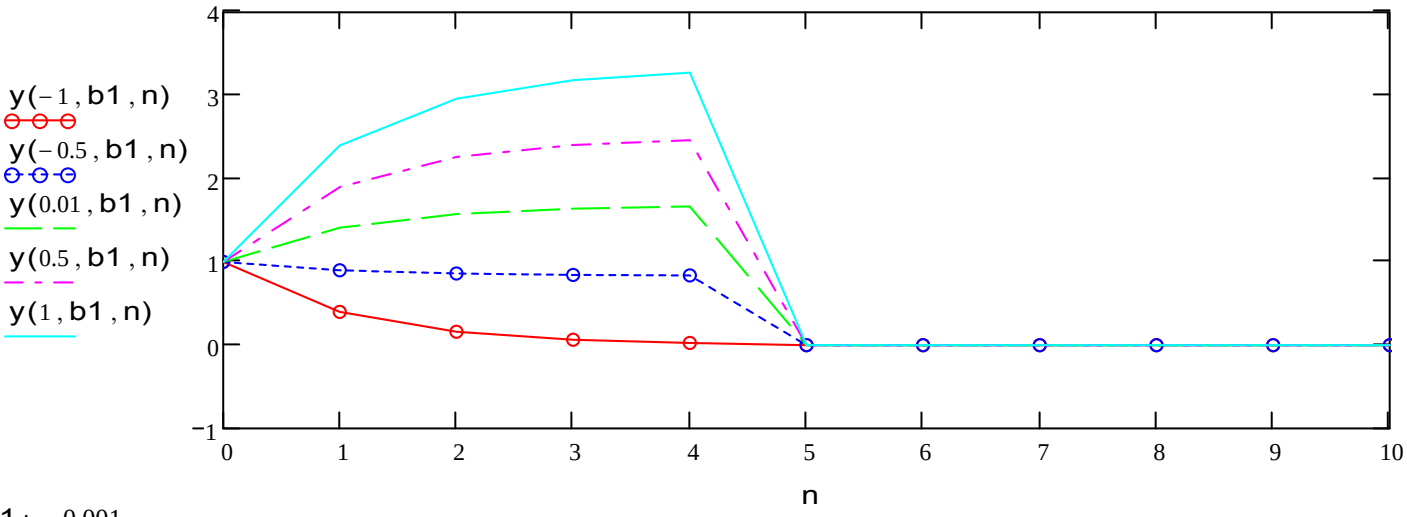
$y1(a1, b1, n) := g(a1, b1, n) \cdot one(n, 0)$ $y2(a1, b1, n) := g(a1, b1, n) \cdot one(n, ni$

$y(a1, b1, n) := y1(a1, b1, n) - y2(a1, b1, n)$

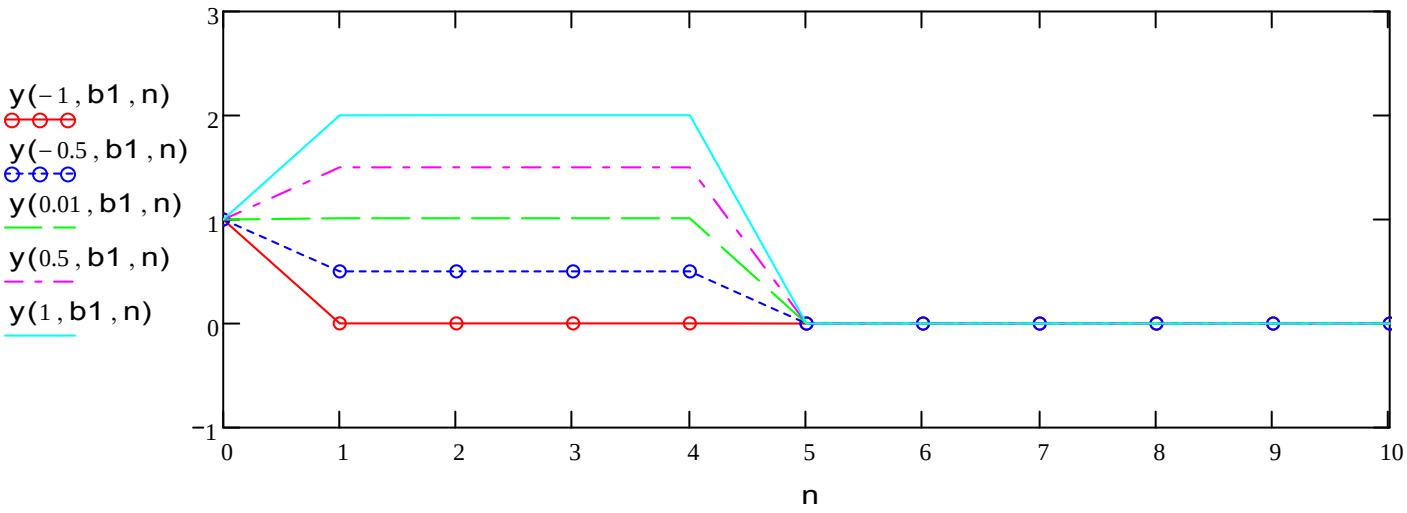
$b1 := -0.9$



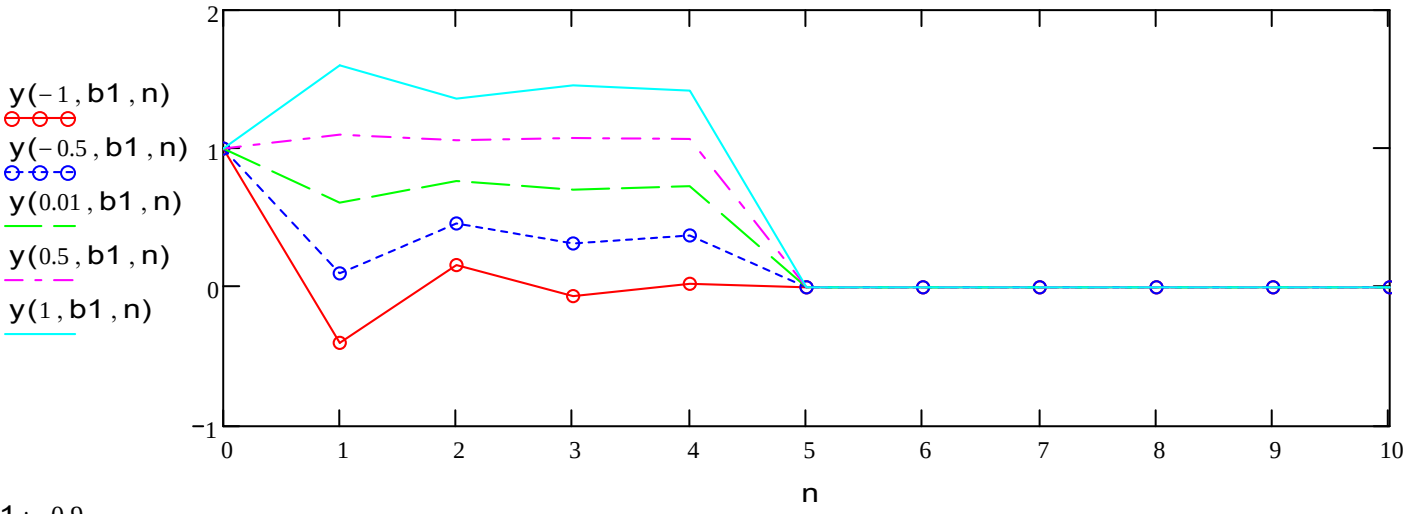
$b1 := -0.4$



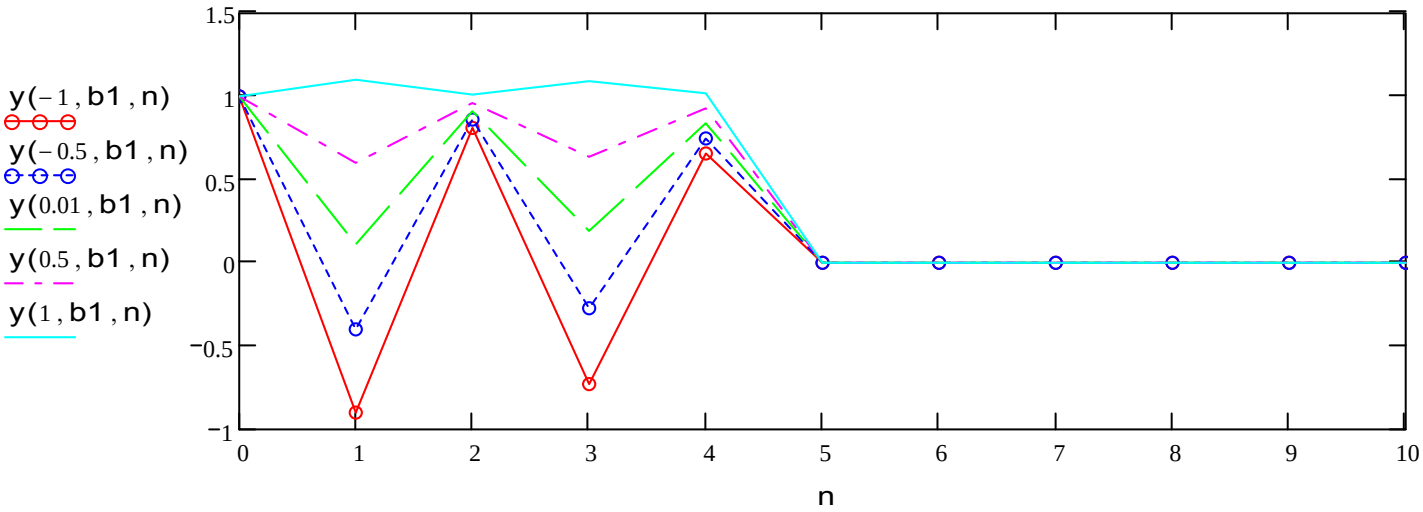
$b1 := -0.001$



b1 := 0.4



b1 := 0.9



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