






Bouncee maths

Linear

Name	Function	Domain	Graph
In	$f(x) = x$	$0 \leq x \leq 1$	
Spike	$f(x) = 2x$ $g(x) = 2(1 - x)$	$0 \leq x \leq 0.5$ $0.5 < x \leq 1$	

Sinus





Name	Function	Domain	Graph
In	$f(x) = -\cos(0.5x\pi) + 1$	$0 \leq x \leq 1$	
Out	$f(x) = \sin(0.5x\pi)$	$0 \leq x \leq 1$	
InOut	$f(x) = -0.5\cos(x\pi) + 0.5$	$0 \leq x \leq 1$	
Spike	$f(x) = -\cos(x\pi) + 1$ $g(x) = \cos(x\pi) + 1$	$0 \leq x \leq 0.5$ $0.5 < x \leq 1$	

Blinn-Wyvill Approximation to the Raised Inverted Cosine





Optimization for the sinus functions

Name	Function	Domain
In	$f(x) = 8(0.5x)^6/9 - 34(0.5x)^4/9 + 44(0.5x)^2/9$	$0 \leq x \leq 1$
Out	$f(x) = 8(0.5(1 - x))^6/9 - 34(0.5(1 - x))^4/9 + 44(0.5(1 - x))^2/9 - 1$	$0 \leq x \leq 1$
InOut	$f(x) = 4x^6/9 - 17x^4/9 + 22x^2/9$	$0 \leq x \leq 1$
Spike	$f(x) = 8x^6/9 - 34x^4/9 + 44x^2/9$ $g(x) = 8(1 - x)^6/9 - 34(1 - x)^4/9 + 44(1 - x)^2/9$	$0 \leq x \leq 0.5$ $0.5 < x \leq 1$





Quadratic

Name	Function	Domain	Graph
In	$f(x) = x^2$	$0 \leq x \leq 1$	
Out	$f(x) = 1 - (x - 1)^2$	$0 \leq x \leq 1$	
InOut	$f(x) = 2x^2$ $g(x) = 1 - 0.5(2x - 2)^2$	$0 \leq x \leq 0.5$ $0.5 < x \leq 1$	
Spike	$f(x) = 4x^2$ $g(x) = (2x - 2)^2$	$0 \leq x \leq 0.5$ $0.5 < x \leq 1$	



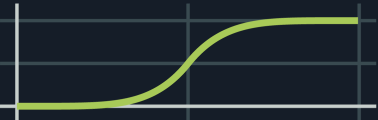
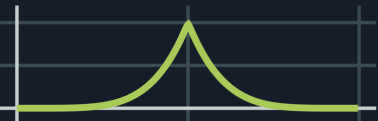
Cubic

Name	Function	Domain	Graph
In	$f(x) = x^3$	$0 \leq x \leq 1$	
Out	$f(x) = 1 + (x - 1)^3$	$0 \leq x \leq 1$	
InOut	$f(x) = 4x^3$ $g(x) = 1 + 4(x - 1)^3$	$0 \leq x \leq 0.5$ $0.5 < x \leq 1$	
Spike	$f(x) = 8x^3$ $g(x) = -(2x - 2)^3$	$0 \leq x \leq 0.5$ $0.5 < x \leq 1$	



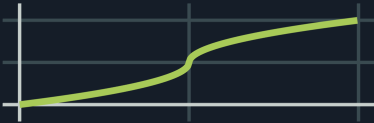
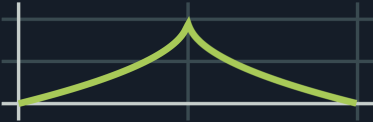
Quartic

Name	Function	Domain	Graph
In	$f(x) = x^4$	$0 \leq x \leq 1$	
Out	$f(x) = 1 - (x - 1)^4$	$0 \leq x \leq 1$	
InOut	$f(x) = 0.5 - 8(x - 0.5)^4$ $g(x) = 0.5 + 8(x - 0.5)^4$	$0 \leq x \leq 0.5$ $0.5 < x \leq 1$	
Spike	$f(x) = 16x^4$ $g(x) = (2x - 2)^4$	$0 \leq x \leq 0.5$ $0.5 < x \leq 1$	



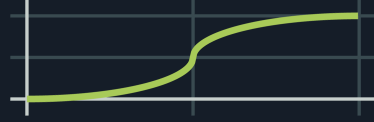
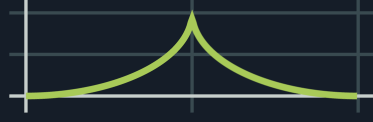
Quintic

Name	Function	Domain	Graph
In	$f(x) = x^5$	$0 \leq x \leq 1$	
Out	$f(x) = 1 + (x - 1)^5$	$0 \leq x \leq 1$	
InOut	$f(x) = 16x^5$ $g(x) = 1 + 16(x - 1)^5$	$0 \leq x \leq 0.5$ $0.5 < x \leq 1$	
Spike	$f(x) = 32x^5$ $g(x) = -(2x - 2)^5$	$0 \leq x \leq 0.5$ $0.5 < x \leq 1$	

Exponential

Name	Function	Domain	Graph
In	$f(x) = 1 - \sqrt{1-x}$	$0 \leq x \leq 1$	
Out	$f(x) = \sqrt{x}$	$0 \leq x \leq 1$	
InOut	$f(x) = 0.5 - 0.5\sqrt{1-2x}$ $g(x) = 0.5 + 0.5\sqrt{2x-1}$	$0 \leq x \leq 0.5$ $0.5 < x \leq 1$	
Spike	$f(x) = 1 - \sqrt{1-2x}$ $g(x) = 1 + \sqrt{2x-1}$	$0 \leq x \leq 0.5$ $0.5 < x \leq 1$	

Circular

Name	Function	Domain	Graph
In	$f(x) = 1 - \sqrt{1-x^2}$	$0 \leq x \leq 1$	
Out	$f(x) = \sqrt{1-(x-1)^2}$	$0 \leq x \leq 1$	
InOut	$f(x) = 0.5 - \sqrt{0.25-x^2}$ $g(x) = 0.5 + \sqrt{0.25-(x-1)^2}$	$0 \leq x \leq 0.5$ $0.5 < x \leq 1$	
Spike	$f(x) = 1 - \sqrt{1-4x^2}$ $g(x) = 1 - \sqrt{2x-2^2}$	$0 \leq x \leq 0.5$ $0.5 < x \leq 1$	

Bounce

$s = 7.5625$ (scalar that narrows parabola)

$d = 2.75$ (offset on the x axis)

Name	Function	Domain
In	$f(x) = 1 - sx^2$	$0 \leq x < 1/d$
	$g(x) = 1 - s(x - 1.5/d)^2 - 0.75$	$1/d \leq x < 2/d$
	$h(x) = 1 - s(x - 2.25/d)^2 - 0.9375$	$2/d \leq x < 5/4d$
	$i(x) = 1 - s(x - 2.625/d)^2 - 0.984375$	$5/4d \leq x < 1$
Out	$f(x) = sx^2$	$0 \leq x < 1/d$
	$g(x) = s(x - 1.5/d)^2 - 0.75$	$1/d \leq x < 2/d$
	$h(x) = s(x - 2.25/d)^2 - 0.9375$	$2/d \leq x < 5/4d$
	$i(x) = s(x - 2.625/d)^2 - 0.984375$	$5/4d \leq x < 1$
InOut	$f(x) = (1 - (s(1 - 2x - 2.625/d)^2 + 0.984375))/2$	$0 \leq x < 1/2d$
	$g(x) = (1 - (s(1 - 2x - 2.5/d)^2 + 0.9375))/2$	$1/2d \leq x < 1/d$
	$h(x) = (1 - (s(1 - 2x - 1.5/d)^2 + 0.75))/2$	$1/d \leq x < d$
	$i(x) = (1 - (s(1 - 2x)^2))/2$	$d \leq x < 2/d$
	$j(x) = (0.5 + (s(1 - 2x)^2))/2$	$2/d \leq x < 5/4d$
	$k(x) = (0.5 + (s(1 - 2x - 1.5/d)^2 + 0.75))/2$	$5/4d \leq x < 5/2d$
	$l(x) = (0.5 + (s(1 - 2x - 2.5/d)^2 + 0.9375))/2$	$5/2d \leq x < 0.5$
	$m(x) = (0.5 + (s(1 - 2x - 2.625/d)^2 + 0.984375))/25$	$0.5 \leq x < 1$
Spike	$f(x) = 1 - (s(1 - 2x - 2.625/d)^2 + 0.984375)$	$0 \leq x < 1/2d$
	$g(x) = 1 - (s(1 - 2x - 2.5/d)^2 + 0.9375)$	$1/2d \leq x < 1/d$
	$h(x) = 1 - (s(1 - 2x - 1.5/d)^2 + 0.75)$	$1/d \leq x < d$
	$i(x) = 1 - (s(1 - 2x)^2)$	$d \leq x < 5/4d$
	$j(x) = 1 - (s(1 - 2(1 - x) - 1.5d)^2 + 0.75))$	$5/4d \leq x < 5/2d$
	$k(x) = 1 - (s(1 - 2(1 - x) - 2.5/d)^2 + 0.9375))$	$5/2d \leq x < 0.5$
	$l(x) = 1 - (s(1 - 2(1 - x) - 2.625/d)^2 + 0.984375)$	$0.5 \leq x < 1$

In and Out



InOut and Spike



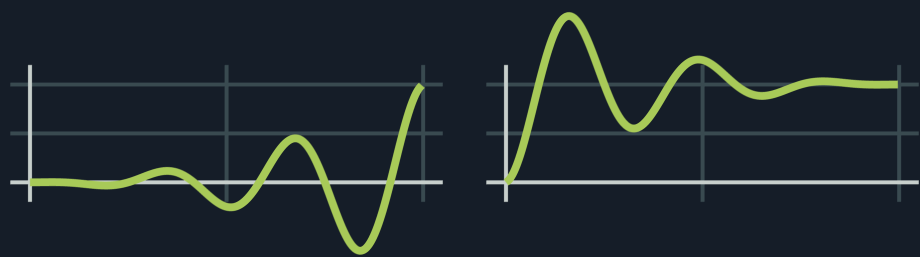
Elastic

a = 1f * 2f (just because)

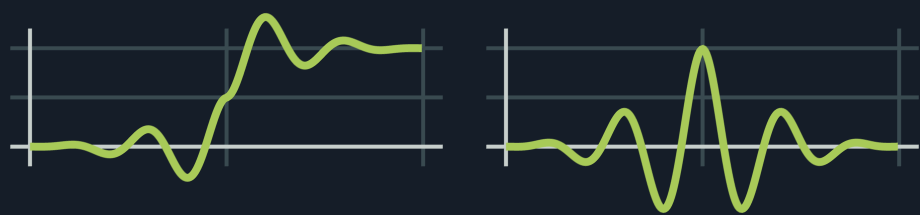
p = 3f * 1.65f (just because)

Name	Function	Domain
In	$f(x) = -(ax)^2 \sin(2\pi p(x - 0.75))$	$0 < x < 1$
Out	$f(x) = 1 + (a(1 - x))^2 \sin(2\pi p((1 - x) - 0.75))$	$0 < x < 1$
InOut	$f(x) = 0.5 + 0.5(-(ax)^2 \sin(2\pi p(x - 0.75)))$	$0 < x < 0.5$
	$g(x) = 0.5 + 0.5(a(1 - x))^2 \sin(2\pi p((1 - x) - 0.75))$	$0.5 < x < 1$
Spike	$f(x) = 0.5 - 0.5(ax)^2 \sin(2\pi p(x - 0.75))2$	$0 < x < 0.5$
	$g(x) = 0.5 + 0.5(a(1 - x))^2 \sin(2\pi p((1 - x) - 0.75))$	$0.5 < x < 1$

In and Out



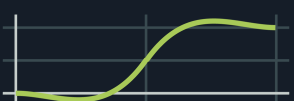


InOut and Spike



Back

$a = 1.70158f$ $p = 1.75f$ (multiplier for the ease in out) $p = 2f$ (for the spike)

Name	Function	Domain	Graph
In	$f(x) = (a + 1)x^3 - ax^2$	$0 \leq x \leq 1$	
Out	$f(x) = 1 - (a + 1)(1 - x)^3 + a(1 - x)^2$	$0 \leq x \leq 1$	
InOut	$f(x) = (a + 1)(px)^3 - a(px)^2$ $g(x) = 1 - (a + 1)(p(1 - x))^3 - a(p(1 - x))^2$	$0 < x < 0.5$ $0.5 < x < 1$	
Spike	$f(x) = (a + 1)(px)^3 - a(px)^2$ $g(x) = (a + 1)(p(1 - x))^3 - a(p(1 - x))^2$	$0 < x < 0.5$ $0.5 < x < 1$	