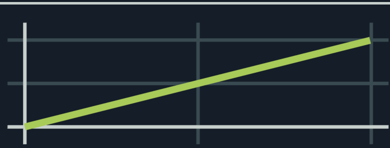
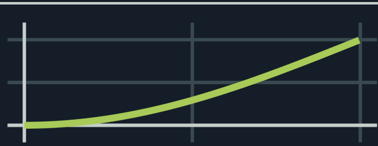
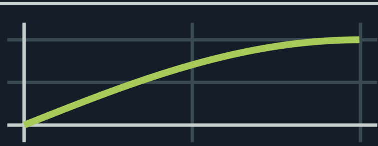
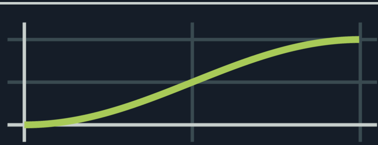
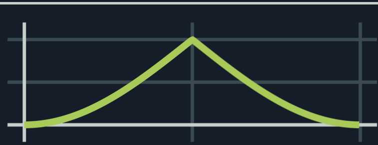
# Bouncee maths

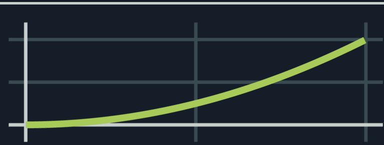
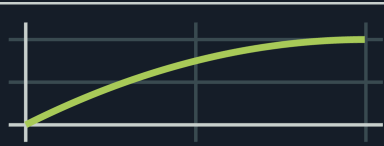
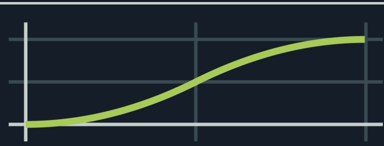
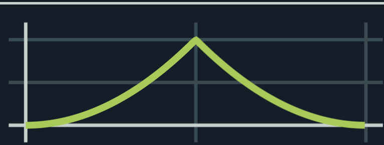
## Linear

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

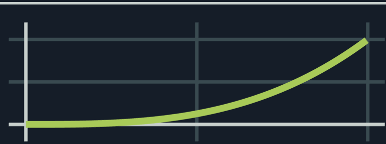
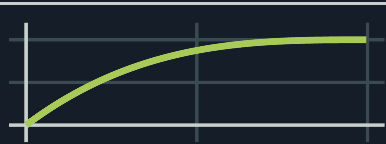
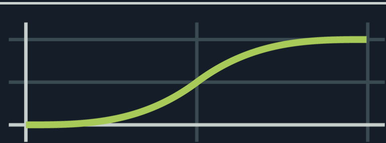
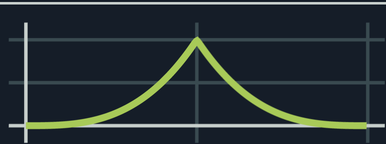
## Sinus

| 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 | $f(x) = -0.5cos(x\pi) + 0.5$ | $0 \leq x \leq 1$ |  |
| Spike | $f(x) = -cos(x\pi) + 1$<br>$g(x) = cos(x\pi) + 1$ | $0 \leq x \leq 0.5$<br>$0.5 < x \leq 1$ |  |

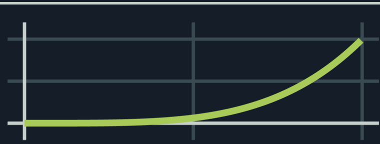
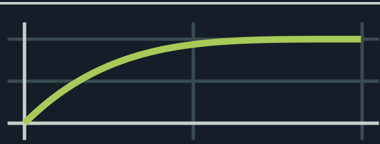
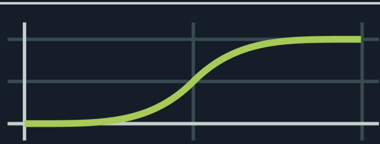
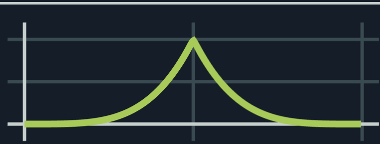
## Quadratic

| 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 | $f(x) = 2x^2$<br>$g(x) = 1 - 0.5(2x-2)^2$ | $0 \leq x \leq 0.5$<br>$0.5 < x \leq 1$ |  |
| Spike | $f(x) = 4x^2$<br>$g(x) = (2x-2)^2$ | $0 \leq x \leq 0.5$<br>$0.5 < x \leq 1$ |  |

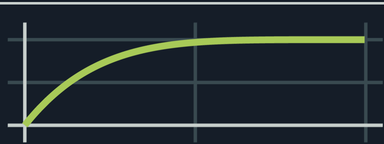
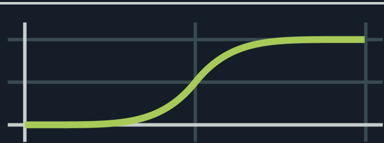
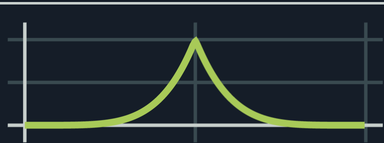
## Cubic

| 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 | $f(x) = 4x^3$<br>$g(x) = 1 + 4(x-1)^3$ | $0 \leq x \leq 0.5$<br>$0.5 < x \leq 1$ |  |
| Spike | $f(x) = 8x^3$<br>$g(x) = -(2x-2)^3$ | $0 \leq x \leq 0.5$<br>$0.5 < x \leq 1$ |  |

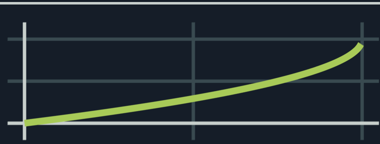
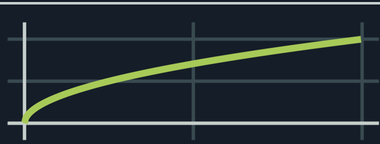
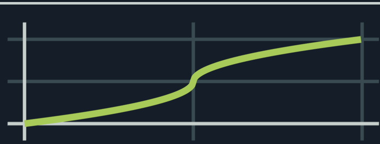
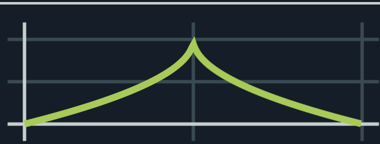
## Quartic

| 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 | $f(x) = 0.5 - 8(x-0.5)^4$<br>$g(x) = 0.5 + 8(x-0.5)^4$ | $0 \leq x \leq 0.5$<br>$0.5 < x \leq 1$ |  |
| Spike | $f(x) = 16x^4$<br>$g(x) = (2x-2)^4$ | $0 \leq x \leq 0.5$<br>$0.5 < x \leq 1$ |  |

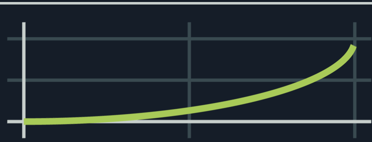
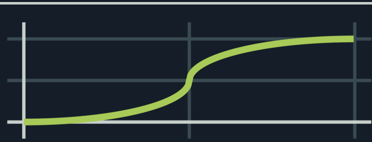
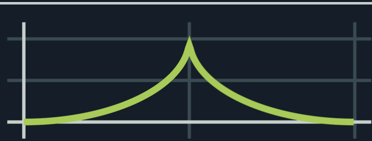
## Quintic

| 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 | $f(x) = 16x^5$<br>$g(x) = 1 + 16(x-1)^5$ | $0 \leq x \leq 0.5$<br>$0.5 < x \leq 1$ |  |
| Spike | $f(x) = 32x^5$<br>$g(x) = -(2x-2)^5$ | $0 \leq x \leq 0.5$<br>$0.5 < x \leq 1$ |  |

## 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 | $f(x) = 0.5 - 0.5\sqrt{1 - 2x}$<br>$g(x) = 0.5 + 0.5\sqrt{2x - 1}$ | $0 \leq x \leq 0.5$<br>$0.5 < x \leq 1$ |  |
| Spike | $f(x) = 1 - \sqrt{1 - 2x}$<br>$g(x) = 1 + \sqrt{2x - 1}$ | $0 \leq x \leq 0.5$<br>$0.5 < x \leq 1$ |  |

## 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 | $f(x) = 0.5 - \sqrt{0.25 - x^2}$<br>$g(x) = 0.5 + \sqrt{0.25 - (x - 1)^2}$ | $0 \leq x \leq 0.5$<br>$0.5 < x \leq 1$ |  |
| Spike | $f(x) = 1 - \sqrt{1 - 4x^2}$<br>$g(x) = 1 - \sqrt{2x - 2}^2$ | $0 \leq x \leq 0.5$<br>$0.5 < x \leq 1$ |  |

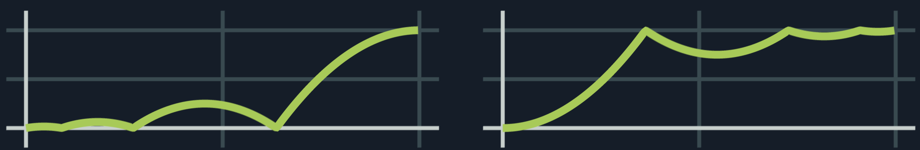
## Bounce

s = 7.5625 (scalar that narrows parabola)

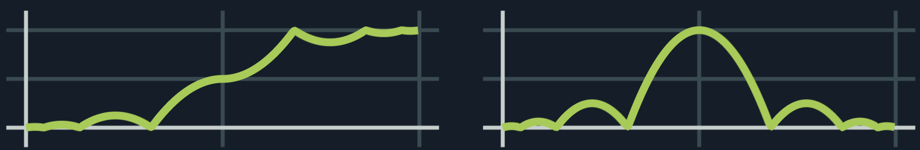
d = 2.75 (offset on the x axis)

| 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



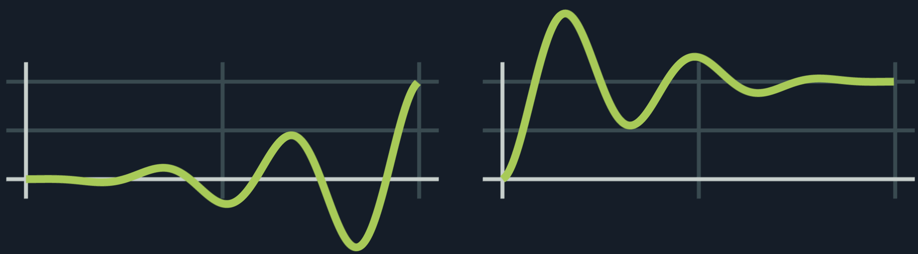
## Elastic

a = 1f * 2f (just because)

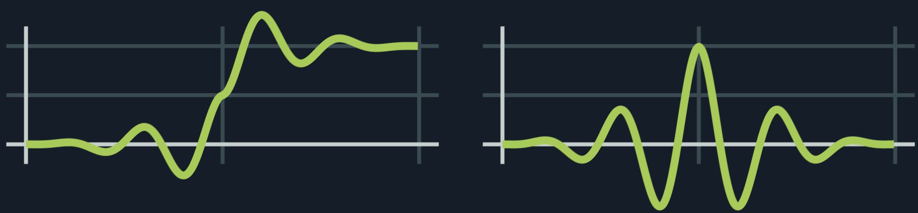
p = 3f * 1.65f (just because)

| 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 | $f(x) = 0.5 + 0.5(-(ax)^2) sin(2\pi p(x - 0.75))$<br>$g(x) = 0.5 + 0.5(a(1 - x))^2 sin(2\pi p((1 - x) - 0.75))$ | $0 < x < 0.5$<br>$0.5 < x < 1$ |
| Spike | $f(x) = 0.5 - 0.5(ax)^2 sin(2\pi p(x - 0.75))2$<br>$g(x) = 0.5 + 0.5(a(1 - x))^2 sin(2\pi p((1 - x) - 0.75))$ | $0 < x < 0.5$<br>$0.5 < x < 1$ |

In and Out



InOut and Spike



Back

Polynomial shaping:

Inverted Cos

Double Cubic

Double Cubic Blend

Double Odd