nn / sigmoid

wiki

$$S(t) = \frac{1}{1 + e^{-t}}$$

$$S'(t) = S(t)(1 - S(t))$$

```
plotly()
plot(x, [xx * (1-xx) for xx in x], title="dsigmoid")
```

derivative

- derivative should be function of sigmoid (to make computation easier)
- derivative should be bell-shaped

Properties [edit]

In general, a sigmoid function is real-valued and differentiable, having either a non-negative or non-positive first derivative[*citation needed*] which is bell shaped. There are also a pair of horizontal asymptotes as $t \to \pm\infty$. The differential equation $\frac{\mathrm{d}}{\mathrm{d}t}S(t) = c_1 S(t)\left(c_2 - S(t)\right)$, with the inclusion of a boundary condition providing a third degree of freedom, c_3, provides a class of functions of this type.

The logistic function has this further, important property, that its derivative can be expressed by the function itself,

$$S'(t) = S(t)(1 - S(t)).$$