

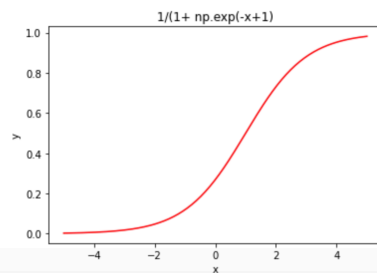
1. $y = -\frac{1}{2}gt^2 + ut + c$
 $g = 10, u = 5, c = 1$
 $y = -5t^2 + 5t + 1$
 $y' = -10t + 5$
if $y' = -10t + 5 = 0$
 $t = \frac{1}{2}$
 $y'' = -10 < 0$
maximum height $= -\frac{1}{2} \times 10 \times (\frac{1}{2})^2 + 5 \times \frac{1}{2} + 1$
 $= \frac{9}{4}$

2. $f(x) = 2x^3 - 3x^2 - 36x + 2$
 $f'(x) = 6x^2 - 6x - 36$
if $f'(x) = 0$ $f'(x) = 6(x-3)(x+2) = 0$
 $f'(x) = 6(x^2 - x - 6) \nearrow x = 3$ or $x = -2$
when $x = 3$ $f(x) = 2 \times 3^3 - 3 \times 3^2 - 36 \times 3 + 2$
 $= 54 - 27 - 108 + 2$
 $= -79$
when $x = -2$ $f(x) = 2 \times (-2)^3 - 3 \times (-2)^2 - 36 \times (-2) + 2$
 $= 2 \times (-8) - 3 \times 4 + 72 + 2$
 $= 46$
when $x = 3$ ~~$f(x) = -79$~~ $f''(x) = 12x - 6 = 12 \times 3 - 6 = 30 > 0$
~~maximum = -79~~ minimum = -79
when $x = -2$ $f''(x) = 12x - 6 = 12 \times (-2) - 6 < 0$
maximum = 46

```
In [149]: x=np.linspace(-5,5,200)
y = 1/(1+ np.exp(-x+1))
plt.xlabel("x")
plt.ylabel("y")

plt.plot(x,y,color = 'r')
plt.title('1/(1+ np.exp(-x+1))')
```

Out[149]: Text(0.5, 1.0, '1/(1+ np.exp(-x+1))')



14 $E = -\sum_{i=1}^2 \sum_{j=1}^2 w_{ij} x_i x_j$
 $= -(w_{11} x_1 x_1 + w_{12} x_1 x_2 + w_{22} x_2 x_2 + w_{21} x_2 x_1)$
 $= -(w_{11} x_1^2 + w_{12} x_1 x_2 + w_{22} x_2^2 + w_{21} x_2 x_1)$
 $\frac{\partial E}{\partial x_1} = -(2w_{11} x_1 + w_{12} x_2 + w_{21} x_2)$
 $= -2w_{11} x_1 - (w_{12} + w_{21}) x_2$
 $\frac{\partial E}{\partial w_{12}} = -(x_1 x_2)$
 $= -x_1 x_2$