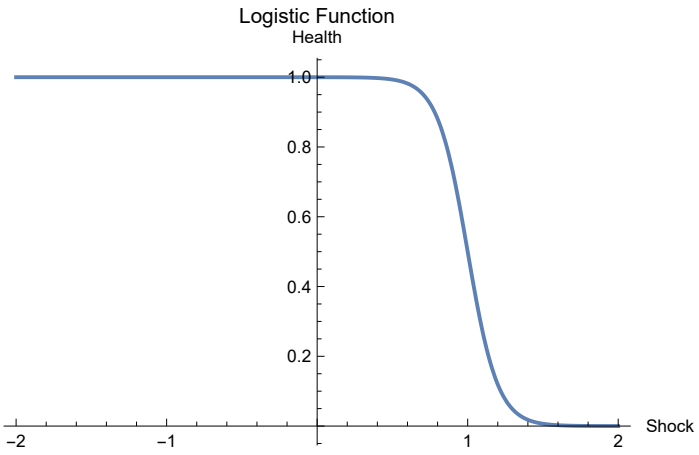
Convexity

Nonlinearity

In[•]:=
```
k = 1;
Plot[1 / (1 + Exp[10 * (x - k)]), {x, -2, 2},
 PlotLabel → "Logistic Function", AxesLabel → {"Shock", "Health"}]
```

Out[•]=



In[•]:=
```
Mean[{1.5, 1.5, 1.5, 1.5, 1.5}]
```

Out[•]=

```
1.5
```

In[•]:=
```
N@Mean[{0, 0, 0, 0, 2}]
```

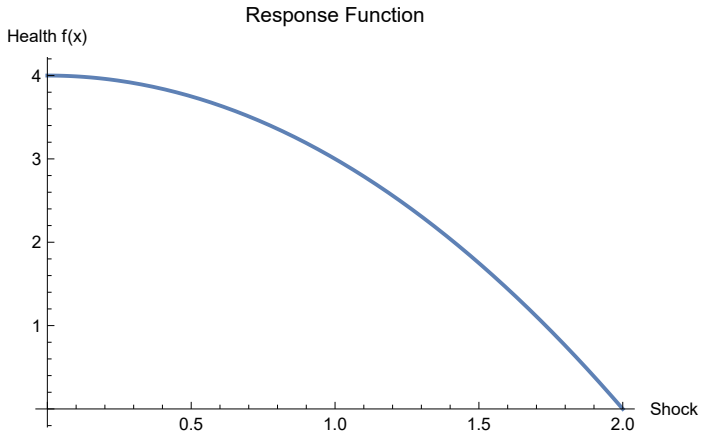
Out[•]=

```
0.4
```

But you die in the second!

In[•]:=
```
Plot[-x^2 + 4, {x, 0, 2}, PlotLabel → "Response Function",
 AxesLabel → {"Shock", "Health f(x)"}]
```

Out[•]=



Antifragility Inequality

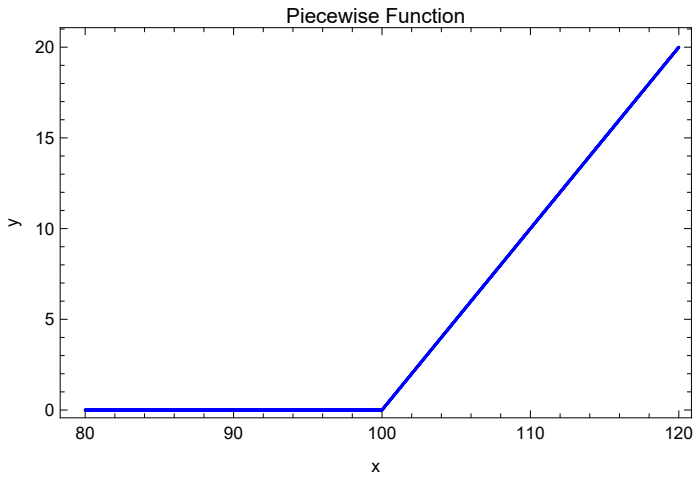
$\sum_{i=1}^{N} \omega_i f(x_i) \leq f\left(\sum_{i=1}^{N} \omega_i x_i\right)$

Volatility

$\frac{1}{2}\left(C_{100}(120) + C_{100}(80)\right) \geq C_{100}(100)$

In[•]:=
```
ListPlot[Table[{x, Piecewise[{{0, 0 < x ≤ 100}, {x - 100, x > 100}}]}, {x, 80, 120, 0.01}],
 PlotStyle → Blue, Frame → True, Axes → True,
 FrameLabel → {"x", "y"}, PlotLabel → "Piecewise Function"]
```

Out[•]=



Anything with a floor, convex. Anything with a ceiling, concave.

Also, you can detect convexity or concavity by checking the slope at the start.

In[•]:=
```
k = 5;
Plot[1 / (1 + Exp[-k (x - 0.5)]), {x, -10, 10},
 PlotLabel → "Sigmoid Curve Function", AxesLabel → {"Shock", "Health"}, ImageSize → Full]
```

Out[•]=