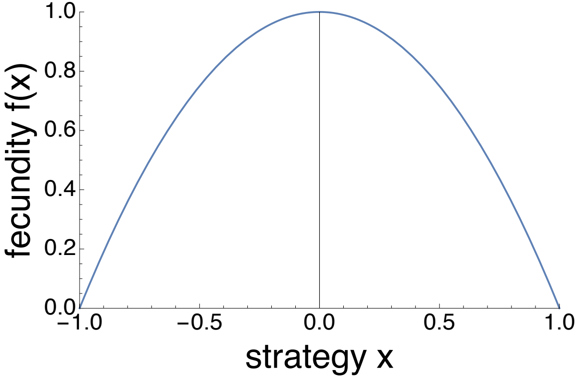
Exercice 1

The graph of fecundity $f(x) = 1 - x^2$ as a function of phenotype (or strategy) x is a dome shaped curve



Exercice 1

Since fitness is $w(x,y) = kf(x)$ with $f(x) = 1 - x^2$, the selection gradient on the trait at y is

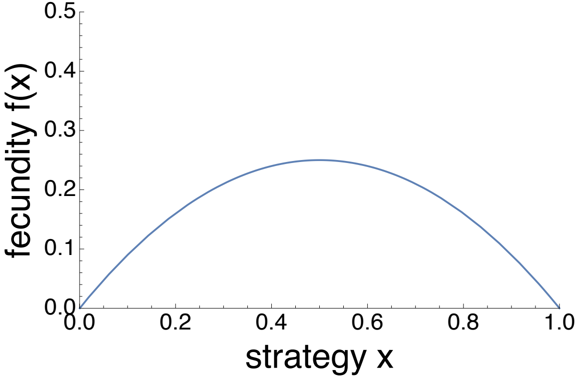
$$S(y) = \left.\frac{\partial w(x,y)}{\partial x}\right|_{x=y} = -2ky$$

Thus, the singular phenotype (satisfying $S(y^*) = 0$) is $y^* = 0$. This strategy is uninvadable since at the singular point we have

$$\left.\frac{\partial^2 w(x,y)}{\partial x^2}\right|_{x=y=y^*} = -2k < 0$$

Exercice 2

The graph of fecundity $f(x) = x(1-x)$ as a function of phenotype (or strategy) x is a dome shaped curve



Exercice 2

Since fitness is $w(x, y) = kf(x)$ with $f(x) = x(1-x)$, the selection gradient on the trait at y by the chain rule is is

$$S(y) = \left.\frac{\partial w(x, y)}{\partial x}\right|_{x=y} = k\,(1-2y)$$

Thus, the singular phenotype (satisfying $S(y^*) = 0$) is $y^* = 1/2$. This strategy is uninvadable since at the singular point we have

$$\left.\frac{\partial^2 w(x, y)}{\partial x^2}\right|_{x=y=y^*} = -2k < 0$$