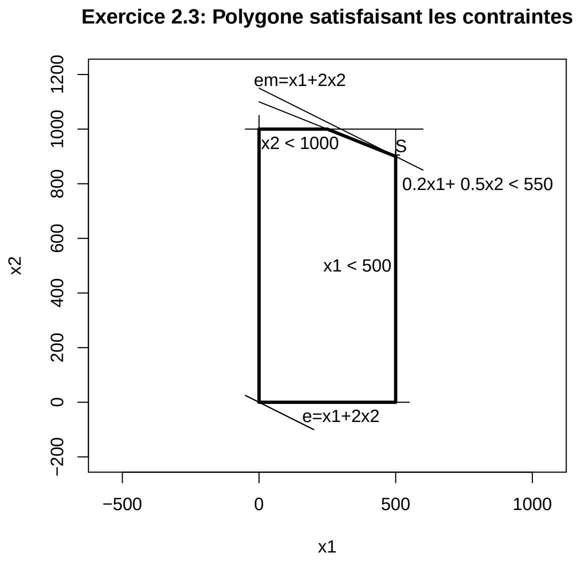
Exercice 1. $\displaystyle\int_0^1 t^3 dt = \left[\frac{1}{4}t^4\right]_0^1 = \frac{1}{4} - 0 = \frac{1}{4}.$

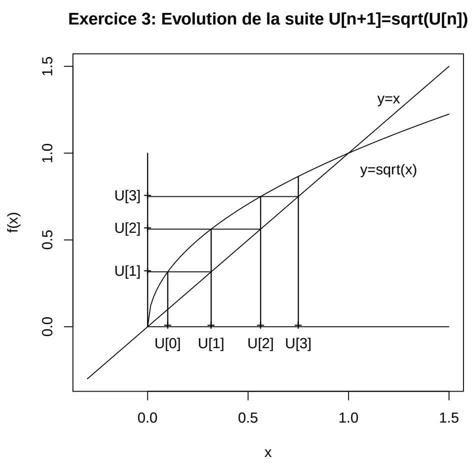
Exercice 2.

1. $e = 1x_1 + 2x_2$.
2. $0 \le x_1 \le 500$, $0 \le x_2 \le 1000$, $0.2x_1 + 0.5x_2 \le 550$.
3.



4. Le maximum est atteint au sommet $S = (500, 900)$ du polygone. Ainsi, le maximum d'énergie sous contraintes e_m que peut acquérir l'animal est $e_m = 500 + 2 \times 900 = 2300$.

Exercice 3.



Exercice 4.

1. $\displaystyle\int_0^1 x\cos(x^2)dx = \left[\frac{1}{2}\sin(x^2)\right]_0^1 = \frac{1}{2}\sin(1) - \frac{1}{2}\sin(0) = \frac{1}{2}\sin(1).$
2. $\displaystyle\int_0^\pi \cos^4(x)\sin(x)dx = \left[-\frac{1}{5}\cos^5(x)\right]_0^\pi = +\frac{1}{5} + \frac{1}{5} = \frac{2}{5}.$
3. On pose : $u = x$ et $v' = e^x$. On a $u' = 1$ et $v = e^x$. D'après la formule d'IPP, on a
$$\int_0^{2\pi} xe^x dx = [xe^x]_0^{2\pi} - \int_0^{2\pi} e^x dx = 2\pi e^{2\pi} - [e^x]_0^{2\pi} = 2\pi e^{2\pi} - e^{2\pi} + 1 = (2\pi - 1)e^{2\pi} + 1.$$