

1.4 Rational Consumer Choice

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Constant Elasticity of Substitution

$$U(x) = (x_1^{1/2} + x_2^{1/2})^2,$$

so that the elasticity of substitution is $\sigma = \frac{1}{1-r} = 2$.

The consumer has income of \$100 and the prices of goods one and two are \$2 and \$1, respectively.

```
library(Rsolnp)
r = 0.5; p1 = 2; p2 = 1; m = 100
ux <- function(x) {-(x[1]^r + x[2]^r)^(1/r)}
bc <- function(x) {p1 * x[1] + p2 * x[2]}
par(mar = c(2.5, 2.5, 0, 0))
```

Computational solution.

```
eq <- solnp(  
  pars = c(1, 1), fun = ux,  
  ineqfun = bc, ineqLB = 0, ineqUB = m,  
  LB = c(0, 0), UB = c(Inf, Inf),  
  control = c(trace = 0))  
eq$pars
```

```
## [1] 16.66667 66.66666
```

```
-eq$lagrange
```

```
##      [,1]
```

```
## [1,] 1.5
```

```
-tail(eq$values, 1)
```

```
## [1] 150
```

Graphical solution.

```
curve((( -tail(eq$values, 1))^r - x^r)^(1/r), col='green',  
      from = 0, to = m / p1, ylim = c(0, m / p2),  
      xlab = expression(x[1]), ylab = expression(x[2]))  
abline(m / p2, -p1 / p2, col = 'red')  
points(x = eq$pars[1], y = eq$pars[2], pch = 20)
```

