ECO 420Y - Homework 3

Joe White

2025-10-07

Question 1

$$\min_{x_1, x_2} \; -8x_1 - 16x_2 + x_1^2 + 4x_2^2$$

subject to

$$x_1 + x_2 \leq 5, \quad x_1 \leq 3, \quad x_1 \geq 0, \quad x_2 \geq 0.$$

```
library(quadprog)

# objective: min -8x1 -16x2 + x1^2 + 4x2^2
Dmat <- matrix(c(2,0,
                 0,8), 2, 2, byrow = T)
dvec <- c(8,16)

# constraints
Amat <- t(matrix(c(-1,-1,
                   -1, 0,
                    1, 0,
                    0, 1), 4, 2, byrow = T))
bvec <- c(-5,-3,0,0)

sol  <- solve.QP(Dmat, dvec, Amat, bvec)

xopt <- sol$solution
f    <- function(x) -8*x[1] -16*x[2] + x[1]^2 + 4*x[2]^2

cat("x* =", paste(xopt, collapse = ", "), "\n")
```

```
## x* = 3, 2
```

```
cat("f(x*) =", f(xopt), "\n")
```

```
## f(x*) = -31
```