$$\min_x \; \tfrac{1}{2} x^T Q x + c^T x$$

$$Ax = b$$

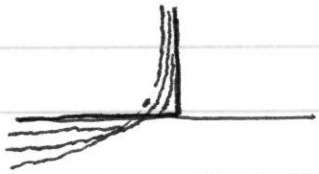
$$\begin{bmatrix} Q & A^T \\ A & 0 \end{bmatrix} \begin{bmatrix} x \\ v \end{bmatrix} = \begin{bmatrix} \; \end{bmatrix}$$

Newton — switch out criterion with $f(x)$; replace f by quad. (repeatedly)

Interior point methods — add inequality constraints $h_i(x) \le 0$, $i = 1 .. m$

replace h_i by smooth functions in crit. (repeatedly)

$$-\log(-u) \cdot \frac{1}{t} \quad \text{vs} \quad I\{u \le 0\}$$



Lagrangian:

$$t f(x) + \phi(x) + w^T(Ax - b)$$

$$t \nabla f(x^*(t)) - \sum \frac{1}{h_i(x^*(t))} \nabla h_i(x^*(t)) + A^T w = 0$$

$$\nabla f(x^*(t)) + \sum \underbrace{\frac{-1}{t h_i(x^*(t))}}_{u_i} \nabla h_i(x^*(t)) + A^T \underbrace{\frac{w}{t}}_{v} = 0$$

(complementary slackness is not met!)

$$f(x^*(t)) - g(u^*, v^*) \le \frac{m}{t}$$

$$\Rightarrow f(x^*(t)) - f^* \le \frac{m}{t}$$

$t^{(1)} = \mu t^{(0)}$

---

solve $Ax = b$

define $s = \max_i h_i(x) + 0.01$

$h_i(x) \leq s$