MATLAB Functions for Optimization

fminbnd: constrained, a single variable function

$\min_x f(x)$ such that $x_1 < x < x_2$

Syntax:

[x, fval] = fminbnd(fun, x_1, x_2, options)

EX Find max. of $f(x) = 2\sin x - \frac{x^2}{10}$

within interval $x_1 = 0$ and $x_2 = 4$

Define a function:

file: "fx.m"

```
function f = fx(x)
    f = -(2*sin(x) - (x^2)/10)
```

```
>> [x,f] = fminbnd('fx',0,4)
```

Result: f = -1.7757

x = 1.4275 ⇐

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fminbnd: constrained, a single variable function

$\min_x f(x)$ such that $x_1 < x < x_2$

fminsearch: unconstrained, minimize func. of several variables, (derivative-free method)

$\min_{\underline{x}} f(\underline{x})$

Syntax: `[x,fval] = fminsearch(fun, x0, options)`

(x0 ↓ starting pt.)

Ex: maximize $f(x_1, x_2) = 2 + x_1 - x_2 - 2x_1^2 + 2x_1x_2 + x_2^2$

initial guess: $x_1 = 0.5$, $x_2 = 0.5$

```
>> f = @(x) -(2 + x(1) - x(2) + 2*x(1)^2 + 2*x(1)*x(2) + x(2)^2);
>> [x, fval] = fminsearch(f, [-0.5, 0.5])
```

(`[-0.5, 0.5]` = x0)

```
x = [-1.000   1.500]

fval = 0.75
```

fminunc: Find the min. of unconstrained multivariable function

(Nonlinear programming solver)

$\min_{\underline{x}} f(\underline{x})$

Syntax: `[x,fval] = fminunc(fun, x0, options)`

fmincon: Find the min. of constrained nonlinear multivariate function

$$\min_{\underline{x}} f(\underline{x}) \quad \text{such that} \begin{cases} c(\underline{x}) \leq 0 \\ ceq(\underline{x}) = 0 \\ A\underline{x} \leq b \\ lb \leq x \leq ub \\ A_{eq}x = b_{eq} \end{cases}$$