x^* is a **local min** of $f(x)$

AND

$f(x)$ is convex $\forall x \in \mathbb{R}^n$

AND

x^* is a **local min** of $f(x)$

$\Longrightarrow$ $\nabla f(x^*) = 0$

$\Longrightarrow$ $\mathcal{H}_f(x^*)$ is **p.s.d.**

$\Longleftarrow$ $\nabla f(x^*) = 0$ **AND** $\mathcal{H}_f(x^*)$ is **p.d.**

AND

$\Longrightarrow$ x^* is **global min** of $f(x)$

$f(x)$ is convex $\forall x \in \mathbb{R}^n$

$\Longleftrightarrow$ $\mathcal{H}_f(x)$ is **p.s.d.** $\forall x \in \mathbb{R}^n$

$\Updownarrow$

$\Longleftrightarrow$ All eigenvalues of $\mathcal{H}_f(x)$ are ≥ 0, $\forall x \in \mathbb{R}^n$

$\iff$	$\iff$	$\iff$	$\iff$	$\iff$	$\iff$
$\iff$	$\iff$	$\iff$	$\iff$	$\iff$	$\iff$
$\iff$	$\iff$	$\iff$	$\iff$	$\iff$	$\iff$
$\implies$	$\implies$	$\implies$	$\implies$	$\implies$	$\implies$
$\impliedby$	$\impliedby$	$\impliedby$	$\impliedby$	$\impliedby$	$\impliedby$
$\implies$	$\implies$	$\implies$	$\implies$	$\implies$	$\implies$
$\implies$	$\implies$	$\implies$	$\implies$	$\implies$	$\implies$
x^* is **global min** of $f(x)$	x^* is **global min** of $f(x)$	x^* is **global min** of $f(x)$	x^* is **global min** of $f(x)$	x^* is **global min** of $f(x)$	x^* is **global min** of $f(x)$
$\mathcal{H}_f(x)$ is **p.s.d.** $\forall x \in \mathbb{R}^n$	$\mathcal{H}_f(x)$ is **p.s.d.** $\forall x \in \mathbb{R}^n$	$\mathcal{H}_f(x)$ is **p.s.d.** $\forall x \in \mathbb{R}^n$	$\mathcal{H}_f(x)$ is **p.s.d.** $\forall x \in \mathbb{R}^n$	$\mathcal{H}_f(x)$ is **p.s.d.** $\forall x \in \mathbb{R}^n$	$\mathcal{H}_f(x)$ is **p.s.d.** $\forall x \in \mathbb{R}^n$
All λ_i of $\mathcal{H}_f(x)$ are ≥ 0, $\forall x \in \mathbb{R}^n$	All λ_i of $\mathcal{H}_f(x)$ are ≥ 0, $\forall x \in \mathbb{R}^n$	All λ_i of $\mathcal{H}_f(x)$ are ≥ 0, $\forall x \in \mathbb{R}^n$	All λ_i of $\mathcal{H}_f(x)$ are ≥ 0, $\forall x \in \mathbb{R}^n$	All λ_i of $\mathcal{H}_f(x)$ are ≥ 0, $\forall x \in \mathbb{R}^n$	All λ_i of $\mathcal{H}_f(x)$ are ≥ 0, $\forall x \in \mathbb{R}^n$
$\mathcal{H}_f(x^*)$ is **p.d.**	$\mathcal{H}_f(x^*)$ is **p.d.**	$\mathcal{H}_f(x^*)$ is **p.d.**	$\mathcal{H}_f(x^*)$ is **p.d.**	$\mathcal{H}_f(x^*)$ is **p.d.**	$\mathcal{H}_f(x^*)$ is **p.d.**
$\nabla f(x^*) = 0$	$\nabla f(x^*) = 0$	$\nabla f(x^*) = 0$	$\nabla f(x^*) = 0$	$\nabla f(x^*) = 0$	$\nabla f(x^*) = 0$
$\mathcal{H}_f(x^*)$ is **p.s.d.**	$\mathcal{H}_f(x^*)$ is **p.s.d.**	$\mathcal{H}_f(x^*)$ is **p.s.d.**	$\mathcal{H}_f(x^*)$ is **p.s.d.**	$\mathcal{H}_f(x^*)$ is **p.s.d.**	$\mathcal{H}_f(x^*)$ is **p.s.d.**
$\nabla f(x^*) = 0$	$\nabla f(x^*) = 0$	$\nabla f(x^*) = 0$	$\nabla f(x^*) = 0$	$\nabla f(x^*) = 0$	$\nabla f(x^*) = 0$