2.4.1 → Neyman-Pearson theorem

→ Most powerful tests
  → limit scope to simple hypotheses for H_0 & H_1

  → UMP tests have highest power relative to all
    other α-level tests

→ Neyman-Pearson Theorem

  → A test of size α is a most powerful (ie best critical region)
    iff

Condition	Criteria	
when sample $\in$ critical region	$\frac{L(\theta_0)}{L(\theta_1)} \leq k$	$\Rightarrow F \geq R$ ✗
- - - - $\notin$ - - - - -	$\frac{L(\theta_0)}{L(\theta_1)} \geq k$	$\Rightarrow R$ ✓

{ small ratio values indicate data favors H_1

  → start w/ ratio of likelihoods & manipulate with a
    meaningful T.S. emerges. This helps to determine the
    best critical region

$$\boxed{\frac{L(\theta_0)}{L(\theta_1)} \leq k}$$

2.4.2 → Uniformly Most Powerful tests (UMP)

→ overview → usual scenario is when testing a simple hypothesis vs
    a composite hypothesis

  → In this case, an UMP test has the same best critical region
    for all possibilities described in H_1

→ Essentially, apply the Neyman-Pearson theory & analyze critical
  region to see if it changes based on different possible values under H_1

→ To get the final critical region, use $P(\text{Reject} \mid H_0) = \alpha$
  to find c in $P(T.S \geq c \mid H_0) = \alpha$
                          ↳ use distribution knowledge