Previously on MA40189:

- stationary distribution π of chain with transition probability $q_1(\phi \,|\, \theta)$ satisfies

$$\pi(\phi) \;=\; \sum_{\theta \in S} \pi(\theta) q_1(\phi \,|\, \theta)$$

- Metropolis-Hastings algorithm:
  - sample ϕ from proposal distribution $q(\phi \,|\, \theta)$
  - either accept or reject move according to acceptance probability $\alpha(\theta, \phi)$

$$\alpha(\theta, \phi) \;=\; \min\left(1, \frac{\pi(\phi) q(\theta \,|\, \phi)}{\pi(\theta) q(\phi \,|\, \theta)}\right)$$

  - typically, $\pi(\theta) = f(\theta \,|\, x)$, $\theta = \theta^{(t-1)}$, $\phi = \theta^*$ for sampling from posterior at time t

Today on MA40189:

- if detailed balance

$$\pi(\theta) q_1(\phi \,|\, \theta) \;=\; \pi(\phi) q_1(\theta \,|\, \phi)$$

  satisfied then $q_1(\theta \,|\, \phi)$ are the transition probabilities of chain with stationary distribution π

- demonstrate that Metropolis-Hastings algorithm with proposal $q(\phi \,|\, \theta)$ has π as the stationary distribution