Today on MA40189:

- posterior sampling: if we can sample from the posterior, can use properties of the sample to estimate properties of the posterior
- Monte-Carlo integration: want to estimate

$$I = E(g(X)) = \int_X g(x)f(x)\,dx$$

  - sample $x_1, \ldots, x_N$ from $f(x)$
  - estimate I by sample mean of $g(x_1), \ldots, g(x_N)$
- Importance sampling:
  - rather than sample from $f(x)$ we sample from $q(x)$
  - sample $x_1, \ldots, x_N$ from $q(x)$
  - estimate I by sample mean of $\frac{g(x_1)f(x_1)}{q(x_1)}, \ldots, \frac{g(x_N)f(x_N)}{q(x_N)}$
- Markov Chain Monte Carlo:
  - construct a Markov chain that has the required posterior distribution as its stationary distribution
  - sample from the chain until (approx) convergence
  - from this point, samples from the chain are viewed as a sample of values from the posterior distribution
  - use the resulting sample (from the stationary distribution) to estimate properties of the posterior distribution