Previously on MA40189:

- posterior \( f(\theta \mid x) = c g(\theta) \) where \( g(\theta) \propto f(x \mid \theta) f(\theta) \)
- worked with tractable distributions and identified \( c \) by recognising \( g(\theta) \) as a kernel of a familiar parametric family

Today on MA40189:

- **Bayesian computation**: calculate posterior summaries from distributions \( f(\theta \mid x) = c g(\theta) \) which are
  - mathematically complex
  - often high dimensional
- **Normal approximation** about the mode \( \tilde{\theta} \)
  - \( \theta \mid x \sim N(\tilde{\theta}, I^{-1}(\tilde{\theta} \mid x)) \) where \( I(\theta \mid x) \) is the observed information,
    \[
    I(\theta \mid x) = -\frac{\partial^2}{\partial \theta^2} \log f(\theta \mid x)
    \]
- **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 \( g(x_1), \ldots, g(x_N) \)