1. Warm up! Evaluate the following integrals.

(a) \( \int e^{-5x+1} \, dx \).  \textit{Hint:} Try the substitution \( u = -5x + 1 \).

(b) \( \int x^2 \sqrt{x^3 + 1} \, dx \).  \textit{Hint:} Try a substitution.

(c) \( \int_0^{\pi/4} \frac{\sin \theta}{\cos^3 \theta} \, d\theta \).  \textit{Hint:} Try a substitution.

(d) \( \int_1^2 \sqrt{x - 1} \, (x + 1) \, dx \).  \textit{Hint:} Try the substitution \( u = x - 1 \).

(e) \( \int x \, \sin(3x) \, dx \).  \textit{Hint:} Try integration by parts.

(f) \( \int_1^2 x^3 \ln x \, dx \).  \textit{Hint:} Try integration by parts.

2. Evaluate the following integrals. You may find it useful to try substitution, or integration by parts, or ingenuity, or all of them.

(a) \( \int x^7 e^x \, dx \)

(b) \( \int e^{ax} \sin(bx) \, dx \)

(c) \( \int x^2 \sqrt{2 + x} \, dx \)

(d) \( \int x^3 \sqrt{x^2 + 1} \, dx \)

(e) \( \int_1^{1/4} \frac{1}{x \ln x} \, dx \)

(f) \( \int \frac{\sin x - \cos x}{\sin x + \cos x} \, dx \)

(g) \( \int \frac{\cos \sqrt{t}}{\sqrt{t}} \, dt \)

(h) \( \int \cos \sqrt{t} \, dt \)

(i) \( \int x^2 \arcsin x^3 \, dx \)

(j) \( \int x \arctan x \, dx \)
Further questions

Try these questions only if you have finished all the previous ones.

3. Compute the following antiderivatives:

   (a) \( \int \tan x \, dx \)
      
      \( \text{Hint: Write } \tan x = \frac{\sin x}{\cos x} \text{ and use a clever substitution.} \)

   (b) \( \int \tan^2 x \, dx \)
      
      \( \text{Hint: Remember that } \sec^2 x = \tan^2 x + 1. \)

   (c) \( \int \tan^3 x \, dx \)
      
      \( \text{Hint: } \tan^3 x = \tan x \tan^2 x. \)

   (d) \( \int \tan^4 x \, dx \)
      
      \( \text{Hint: No hint for you!} \)