

Practice Assessment

Antiderivates

These **practice problems** are designed to help you **prepare for our course exams** and **assess your understanding** of the course material at the expected level. Aim to complete them **in class, during tutoring, office hours, or on your own**, and try to solve them **without notes or a calculator**, just like on the **actual exams**. Remember, **practice makes perfect**, so don't hesitate to **ask for help** if you get stuck.

1. Find the most general antiderivative for each of the following.

(a) $g(x) = 4x^{-2/3} - 2x^{5/3}$

(b) $f(t) = \frac{2t - 4 + 3\sqrt{t}}{\sqrt{t}}$

(c) $h(q) = \frac{5q^2 - 6q + 4}{q^2}, \quad q > 0$

$$(d) \ f(t) = \frac{2t - 4 + 3\sqrt{t}}{\sqrt{t}}$$

$$(e) \ h(x) = \sec^2(x) + \pi \cos(x)$$

$$(f) \ g(v) = 2 \cos(v) - \frac{3}{\sqrt{1 - v^2}}$$

$$(g) \ k(y) = 3\sqrt{y} - 2\sqrt[3]{y}$$

2. Find the indefinite integral.

(a) $\int \frac{1 + \sqrt{x} + x}{x} dx$

(b) $\int (u + 4)(2u + 1) du$

(c) $\int \left(e^x + \frac{1}{x} \right) dx$

(d) $\int \left(\frac{1+r}{r} \right)^2 dr$

(e) $\int \left(\sqrt[3]{x} + \frac{1}{\sqrt[3]{x}} \right) dx$

3. Find the function f satisfying the given properties:

(a) $f''(t) = t^2 + \frac{1}{t^2} \quad t > 0, \quad f(2) = 3, \quad f'(1) = 2.$

(b) $f''(x) = e^x - 2 \sin(x), \quad f(0) = 3, \quad f'\left(\frac{\pi}{2}\right) = 0.$