(1) Compute the following integrals:

(a) \[ \int \frac{\sin \sqrt{x+1} \cos \sqrt{x+1}}{\sqrt{x+1}} \, dx \]

Substitute \( y = \sqrt{x+1} \); then \( du = \frac{1}{2\sqrt{x+1}} \, dx \), hence

\[ \int \frac{\sin \sqrt{x+1} \cos \sqrt{x+1}}{\sqrt{x+1}} \, dx = 2 \int (\sin u)(\cos u) \, du = \sin^2 \sqrt{x+1} + C. \]

(b) \[ \int xf'(3x^2+1) \, dx \], where \( f \) is a differentiable function.

Substitute \( u = 3x^2 + 1 \); then \( du = 6x \, dx \), hence

\[ \int xf'(3x^2+1) \, dx = \frac{1}{6} f'(u) \, du = \frac{1}{6} f(u) + C = \frac{1}{6} f(3x^2 + 1) + C. \]

(2) Compute the area enclosed by the graphs of the functions \( y = x^2 \) and \( y = x - x^2 \).

The function \( y = x - x^2 = -x^2 + x \) is a parabola bent downwards: you should know how to graph this! It has zeros at \( x = 0 \) and \( x = 1 \).

To find the intersection with the other parabola, put \( x^2 = x - x^2 \), and you get \( x = 0 \) and \( x = \frac{1}{2} \). Since \( x - x^2 \) is the top function, the area is

\[ \int_0^{1/2} (x - x^2 - x^2) \, dx = \int_0^{1/2} (x - 2x^2) \, dx = \frac{1}{2} x^2 - \frac{2}{3} x^3 \bigg|_0^{1/2} = \frac{1}{8} - \frac{1}{12} = \frac{1}{24}. \]