

★ Answer and mark clearly the questions in the provided answer sheets.
Write down your name and student's ID on the each answer sheet you used.
* **Note:** No points will be given if no arguments are provided for an answer.

For your information:

- $\int \sin u \, du = -\cos u + C$
- $\int \cos u \, du = \sin u + C$
- $\int \sec^2 u \, du = \tan u + C$
- $\int \sec u \tan u \, du = \sec u + C$
- $\sin^2 u + \cos^2 u = 1$ and $\tan^2 u + 1 = \sec^2 u$

Good Luck!

~~ Yuling ☺

1. (10 points) Find the average value of

$$f(x) = \frac{3}{x+2}$$

on the interval $[1, 5]$, then find the x -value in the interval for which the function is equal to its average value.

2. (90 points) Find

(a) $\int_0^1 e^{2x} \sqrt{e^{2x} + 1} \, dx$

(b) $\int_1^4 |x - 2| \, dx$

(c) $\int_1^e x^3 \ln x \, dx$

(d) $\int_1^2 x^2 e^x \, dx$

(e) $\int x (\ln x)^2 \, dx$

(f) $\int \frac{x e^{2x}}{(2x+1)^2} \, dx$

(g) $\int \frac{x^2}{(3x-5)^2} \, dx$

(h) $\int \frac{1}{x^2 \sqrt{1-x^2}} \, dx$

(i) $\int 6x \sec^2 x \, dx$