⋆ 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!   ~~ *Yes* ⌣̈

1. (60 points) Find

$$(a) \int \frac{x^2+3}{(x^3+9x-4)^2} \, dx \qquad (b) \int \frac{x^2+2x+5}{x-1} \, dx \qquad (c) \int \frac{1}{x \ln x} \, dx$$

$$(d) \int \frac{1+e^{-x}}{1+xe^{-x}} \, dx \qquad (e) \int \frac{e^{2x}+2e^x+1}{e^x} \, dx \qquad (f) \int x(\ln x)^2 \, dx$$

2. (10 points) Find $f(x)$ whose graph passes through the point $(4, 6)$, and

$$f'(x) = \frac{e^{2/x}}{x^2}.$$

3. (10 points) Find a function f that satisfies the differential equation and the initial conditions: $f''(x) = 2$, $f'(2) = 5$, $f(2) = 10$.

4. (20 points) Find

$$(a) \int \frac{\sin x}{1+\cos x} \, dx \qquad (b) \int \sec^6 \frac{x}{4} \tan \frac{x}{4} \, dx$$