

考試注意事項：

1. 答案紙直行對折，兩直欄書寫作答。
2. 無清楚計算過程，不予計分。

試題：

1. (5%, 5%) Find the following integrals:

a. $\int \frac{dx}{(2x-4)^3}$ b. $\int \sin 5x dx$

2. (5%, 5%)

(a) Find the derivative of the function $h(x) = \int_x^3 \frac{t}{\sqrt{t+1}} dt$

(b) Evaluate the integral $\int_0^{\pi/2} \sqrt{\cos \theta} \sin \theta d\theta$

3. (5%, 5%) Differentiate the following function.

a. $f(x) = x^e + e^x$ b. $y = (\sin x)^{\tan x}$

4. (5%, 5%) Find

a. $\int \frac{e^x}{e^{2x} + 1} dx$ b. $\int \frac{1}{x\sqrt{x^4 - 16}} dx$

5. (10%, 5%) Let R be the region bounded by the graphs of $y = x^2 + 1$, $y = -x + 1$, and $x = 1$. Find the volume of the solid that is obtained by revolving R about the y -axis using

- (a) the method of washers and
- (b) the method of cylindrical shell.

6. (15%) Evaluate the limit by interpreting it as the limit of a Riemann sum of a function on the interval $[0, 1]$:

$$\lim_{n \rightarrow \infty} \frac{1}{n^5} \sum_{k=1}^n k^4$$

7. (15%) Find the length of the graph of $x = \frac{1}{3}y^3 + \frac{1}{4y}$ from $P(\frac{7}{12}, 1)$ to $Q(\frac{67}{24}, 2)$.

8. (15%) Suppose that g is the inverse of a differentiable function f and $H = g \circ g$. If $f(4) = 3$, $g(4) = 5$, $f'(4) = \frac{1}{2}$, and $f'(5) = 2$, find $H'(3)$.