考試科目：微積分
學系組名稱：運輸科學系碩士班不分組

＊可使用本校提供之計算器

1.答案以橫式由左至右書寫在**答案卷**上。2.請依題號順序，並標示題號作答。

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1. (10%) Using the definition, calculate the derivative of the function $f(x) = 2x^2 - 5x$

2. (10%) Find the horizontal asymptotes of the graph of $f(x) = \dfrac{x^3 - 2}{|x|^3 + 1}$

3. (10%) Find dy/dt if $y = \tan^2(\sin^3 t)$

4. (10%) If $f(x, y) = x\cos y + ye^x$, find the second-order derivatives $\dfrac{\partial^2 f}{\partial x^2}$, $\dfrac{\partial^2 f}{\partial y \partial x}$, $\dfrac{\partial^2 f}{\partial y^2}$ and $\dfrac{\partial^2 f}{\partial x \partial y}$

5. (10%) Evaluate the improper integral $\displaystyle\int_0^2 \dfrac{dx}{\sqrt{|x-1|}}$

6. (10%) Evaluate $\displaystyle\int_0^{\pi/4} \sqrt{1 + \cos 4x}\, dx$

7. (10%) Evaluate $\displaystyle\int \dfrac{1}{x^2\sqrt{x^2 + 9}}\, dx$

8. (10%) Evaluate $\displaystyle\iint_R e^{x+2y}\, dA$, $R:\ 0 \le x \le \ln 3,\ \ 1 \le y \le \ln 2$

9. (20%) Sketch the graph of the function $f(x) = 2x - 3x^{2/3}$ using the following steps.
   (a) Identify the domain of $f(x)$ and any asymptotes that may exist.
   (b) Find the critical points and inflection points.
   (c) Find where the curve is increasing and where it is decreasing.
   (d) Identify where the extrema values of $f(x)$ occur.
   (e) Find where the graph of $f(x)$ is concave up and where it is concave down.
   (f) Sketch the graph of the function $f(x) = 2x - 3x^{2/3}$