國立臺灣海洋大學　108 學年度研究所碩士班招生考試試題

考試科目：微積分

系所名稱：運輸科學系碩士班不分組　　＊可使用計算器

1. 答案以橫式由左至右書寫。2. 請依題號順序作答。

For problem 1~10, each counts 10 points (10%).

1. Find $\lim_{x\to 2}\frac{x^3-8}{x-2}$

2. Find $\lim_{x\to 0} x\cot 3x$

3. Find $\frac{dy}{dx}$ for $y=\frac{3x-1}{5x+2}$

4. Please prove the quotient rule:

   If f and g are differentiable at x and $g(x)\neq 0$, then the quotient f/g is differentiable at x and

$$\left(\frac{f}{g}\right)'(x)=\frac{g(x)f'(x)-f(x)g'(x)}{[g(x)]^2}$$

5. Find $\frac{dy}{dt}$ at $t=9$ given that $y=\frac{u+2}{u-1}$, $u=(3s-7)^2$, $s=\sqrt{t}$.

6. Please prove that

If f takes on a local maximum or minimum at c, then either

$f'(c) = 0$ or $f'(c)$ does not exist.

7. Calculate $\int \frac{\ln x}{x} dx$.

8. Evaluate $\int_0^{\sqrt{2\ln 3}} xe^{-x^2/2} dx$.

9. How long does it take for an investment to double at an interest rate r compounded continuously?

10. Calculate $\int_{-r}^{r} \sqrt{r^2 - x^2} dx$, where r is a positive constant.