系　　組　　別	考　試　科　目
經濟學系二年級	微積分

※本考題 ☑可使用 □禁止使用 簡易型電子計算機

※考生請於答案卷內作答

I. **(12%)** Find the domain of the function

　1.1　$f(x) = \dfrac{x+2}{x^2 - 1}$.　　1.2　$f(x) = \dfrac{x^4}{x^2 + x - 6}$

　1.3　$g(x) = \sqrt[4]{x^2 - 6x}$　　1.4　$g(x) = 3x^2 + 2x + 1$

II. **(9%)** Find the value of the one-sided limit

　2.1　$\lim\limits_{x \to 1^-} \dfrac{x+2}{x-1}$　　　　2.2　$\lim\limits_{x \to 1^-} f(x)$　where $f(x) = \begin{cases} 3x & \text{if } x > 1 \\ 4x + 2 & \text{if } x \le 1 \end{cases}$

　2.3　$\lim\limits_{x \to 4^+} \dfrac{x-1}{x-4}$

III. **(21%)**

3.1 (9%) Find the derivative of the following functions

　a.　$f(x) = \left(4x^2 + 3x - 1\right)^{3/2}$

　b.　$f(x) = \dfrac{2x}{\sqrt{3x^2 + 1}}$

　c.　$y = f(x) = \sqrt{3x + 2} \times (9x - 1)^5$

3.2 (4%) Let　$H(x) = \left(f(x)\right)^2$, with f　differentiable at $x = 2$. Find　$H'(2)$　if

　　$f(2) = 4$ and $f'(2) = 3$.

3.3 (8%) Find 'all' of the second-order partial derivatives of the following functions

　　a．　$f(x , y) = x^2 + xy^3$　　　　　　b．　$f(x , y) = e^{-x/y}$

IV. **(16%)** Evaluate the definite or indefinite integrals of the following functions.

　　a.　$\int \sqrt{2}\,dx$　　　b.　$\int_1^e \ln x \, dx$　　　c.　$\int x^2 e^x \, dx$　　　d.　$\int_0^2 x(x^2 - 1)^3 \, dx$

轉後頁

系　　組　　別	考　試　科　目
經濟學系二年級	微積分

※本考題 ☑可使用 □禁止使用 簡易型電子計算機
※考生請於答案卷內作答

V. **(12%)** Use the trapezoidal rule and Simpson's rule to approximate the following value of integral. Compare the result with the exact value of the integral.

$$\int_0^2 x^2 dx \; ; \; n=6$$

VI. **(30%)** The total weekly revenue (in dollars) for a firm in producing and selling its products of A and B is given by

$$R(x, y)= -\frac{1}{4}x^2 - \frac{3}{8}y^2 - \frac{1}{4}xy + 300x + 240y$$

x is the number of product A and y is the number of product B. The total weekly cost attributable to the production is

$$C(x, y)=180x+140y+5000$$

dollars.

(1) Determine how many products of A and B should produce per week to maximize its profit(s), and how much is the profit. Furthermore, please make sure the critical point(s) is a relative maximum, not a relative minimum.

(2) There is a constraint of production and it should be restricted to a total of exactly 230 units (x + y = 230) each week. Under this condition, determine how many products of A and B should produce per week to maximize its profit(s), and how much is the profit.