※注意：禁止使用計算機
※ 注意：請於試卷上「非選擇題作答區」標明題號並依序作答。

- 考試不可使用計算機。
- 請於試卷上「非選擇題作答區」依序作答。
- 保留答案簿前兩面(四頁)為答案區，第五頁之後為計算草稿區。
- 第1至6題為填充題，答案請寫在答案簿第一面(兩頁)，任何計算皆不計分。
- 第7題為計算題，請將計算過程詳細寫在翻面的第三、四頁，只寫答案不計分。

1. Assume a (real valued) function $y = f(x)$ satisfy $y^5 + 9y = x^3 + x$. Suppose $g(x)$ is a (real valued) function satisfying $f(g(x)) = x$.

    (a) (5%) The value $g(1)$ must be 2. True or false? Answer: __(1)__.

    (b) (10%) The derivative $g'(1) =$ __(2)__.

2. An experiment detects that a particle at $(1, 0)$ (on the xy-plane) is moving towards the north at the speed 3 meters per minute. At the same time another particle at $(-2, 1)$ is moving towards the east at the speed 4 meters per minute.

    (a) (5%) Let $s(t)$ be the distance (in meters) between the two particles in t minutes. $s(t) =$ __(3)__.

    (b) (10%) Suppose at $t = t_0$ the two particles are closest to each other. Then $t_0 =$ __(4)__.

3. (10%) Compute the indefinite integral $\int \frac{dx}{(x^2-1)(x+1)} =$ __(5)__.

4. (10%) Let Ω be a regioin (on the xy-plane) enclosed by $x = \sqrt{\ln y}$, $x = 0$ and $y = e$. Let S be the solid obtained by revolving Ω about the y-axis. Let V be the volume of S. $V =$ __(6)__.

5. Let $f(x,y) = x^2 - e^{xy^2}$ and the surface S be the graph of the function $z = f(x,y)$. Let $P = (1,0,0) \in S$ and $p = (1, 0)$ in the xy-plane.

    (a) (10%) If the unit vector u (in the xy-plane) at p is the direction (among all directions at p) along which the height (i.e. the value of z) of S increases most rapidly, then $u =$ __(7)__.

    (b) (10%) Write H for the plane $x + 2y + 3z = 1$ and the curve C for the intersection $S \cap H$. Let L be the tangent line to C at P and N be the plane perpendicular to L at P. Then the equation of N is __(8)__.

6. Let R be the region enclosed by $y = x$, $y = x - 2$, $y = 1$ and $y = 0$.

    (a) (10%) Let A be the area of R. $A =$ __(9)__.

    (b) (5%) The double integral $\iint_R \sqrt{x-y}\, dxdy =$ __(10)__.

7. (15%) Let Ω be the region $\{(x,y) | (x-1)^2 + y^2 < 1\}$. Evaluate the double integral $\iint_\Omega \frac{1}{x}\, dxdy$.

試題隨卷繳回