題號： 385
科目：應用微積分
節次： 2

國立臺灣大學101學年度碩士班招生考試試題

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(答案請寫於答案卷上)

需列計算過程，否則不予計分

填充計算題（總計10題，每題10分）

1. 試求級數 $x - \dfrac{x^2}{2^2} + \dfrac{x^3}{3^2} - \dfrac{x^4}{4^2} + \cdots\cdots$ 之收斂區間 = _____。

2. 星形線(Asteroid) $x = a\cos^3 t$, $y = a\sin^3 t$ 所圍成之面積 = _____。

3. 求下列各線所圍成區域之面積 = _____。

   $xy = \dfrac{a^2}{2}$, $xy = 2a^2$, $y = \dfrac{x}{2}$, $y = 2x$

4. 求出此心臟線 $r = 1 + \sin\theta$ 的長度 = _____。

5. $\displaystyle\int_0^1 \int_{2x}^2 e^{y^2}\, dy\, dx =$ _____。

6. $\displaystyle\int_1^2 \dfrac{e^{1/x}}{x^2}\, dx =$ _____。

7. If $y = x^{\sqrt{x}}$, then $\dfrac{dy}{dx} =$ _____.

8. Let $R = \ln\left(u^2 + v^2 + w^2\right)$, $u = x + 2y$, $v = 2x - y$, $w = 2xy$.

   When $x = y = 1$, $\dfrac{\partial R}{\partial x} =$ _____, and $\dfrac{\partial R}{\partial y} =$ _____.

9. Suppose that $f(x)$ is differentiable everywhere and that $f(0) = -3$ and $f'(x) \le 5$. The largest possible value for $f(2)$ is _____.

10. The half-life of radium-226 is 1590 years.

    (a) A sample of radium-226 has a mass of 100 mg. The formula for the mass of the sample that remains after t years, $m(t)$ is _____.

    (b) The time taken for the mass of the sample to be reduced to 30 mg is _____.

(答案請寫於答案卷上)

試題隨卷繳回