

國立清華大學 104 學年度碩士班考試入學試題

系所班組別：科技管理研究所乙組

考試科目（代碼）：微積分(4401)

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*請在【答案卷、卡】作答

1. $\frac{d}{dx} \left[\sec^2(\sqrt{x} + 1) + \int_0^{2x^2+4x+1} \frac{\sin t}{t^2+1} dt \right] = ?$

2. Show that $\sin x > x - \frac{x^3}{6}$ if $x > 0$.

3. Find the absolute maximum and minimum values of the function $f(x) = 2x^3 - 15x^2 + 36x$ on $[1, 5]$.

4. $\int_0^2 \int_{\frac{y}{2}}^1 e^{x^2} dx dy = ?$

5. $\int_{-3}^3 \int_{-\sqrt{9-x^2}}^{\sqrt{9-x^2}} \int_0^{9-x^2-y^2} x^2 dz dy dx = ?$

6. Locate all relative extrema and saddle points of the function $f(x, y) = x^3 + y^2 - 2xy + 7x - 8y + 2$.

7. Determine the interval of convergence for the series $\sum_{k=1}^{\infty} \frac{(x-5)^k}{k(k+1)}$.

8. Find a power series representation of $\int \frac{e^x-1}{x} dx$.

(第一題16分，其餘每題12分)