

科目：微積分 適用：土木系二 電機系二 應化系二 應光系二

考生注意：

1. 依次序作答，只要標明題號，不必抄題。
2. 答案必須寫在答案卷上，否則不予計分。
3. 限用藍、黑色筆作答；試題須隨卷繳回。

本 試 題

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1. $\lim_{x \rightarrow 0} \frac{2(e^x - 1)x^3}{x^2 \sin(x) \sinh(x)} = ?$ (10%)

2. $f(x) = \frac{(x+1)(x+3)(x+5)}{(x-2)^2(x-4)}$. Please find $\frac{df}{dx} = ?$ (10%)

3. (a) $\int e^{2x} x^4 dx = ?$ (10%)

(b) $\int e^{3x} x \cos x dx = ?$ (10%)

4. $\sum_{n=2}^{\infty} n \left(\frac{1}{8}\right)^n = ?$ (10%)

5. $f(x) = \ln(3+x)$. Please find $f^{(9)}(-1)$. (10%)

6. Show that $\sinh^{-1}(x) = \ln(x + \sqrt{x^2 + 1})$. (10%)

7. (10% for each)

(a) Plot $r = 2 \cos(4\theta)$

(b) In graph (a), please find the area of one petal.

(c) In graph (a), please find the tangent line(s) of the graph passing through the origin.