

科目：微積分 適用：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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第 1 頁

編號：331 343 351

## 1. Find the limit

$$(a) \lim_{x \rightarrow 0} \frac{(1/\sqrt{1+x}) - 1}{x} \quad (8\%)$$

$$(b) \lim_{\Delta x \rightarrow 0} \frac{\sin[(\pi/6) + \Delta x] - (1/2)}{\Delta x} \quad (10\%)$$

$$(c) \lim_{x \rightarrow 1^+} (x-1)^{\ln x} \quad (10\%)$$

## 2. Find

$$(a) \int e^{2x} \sin 3x \, dx \quad (10\%)$$

$$(b) \int \frac{1}{e^{2x} + e^{-2x}} \, dx \quad (8\%)$$

$$(c) \int_0^2 \int_{x^2}^{2x} (x^2 + 2y) \, dy \, dx \quad (8\%)$$

$$(d) \int_{-2}^2 \int_{-\sqrt{4-x^2}}^{\sqrt{4-x^2}} \int_0^{(x^2+y^2)/2} (x^2 + y^2) \, dz \, dy \, dx \quad (10\%)$$

## 3. Find the third-degree Taylor polynomial centered at c.

$$f(x) = \tan x, \quad c = -\frac{\pi}{4} \quad (12\%)$$

4. Three sides of a trapezoid have the same length  $s$ . Of all such possible trapezoids, show that the one of maximum area has a fourth side of length  $2s$ .

(12%)

5. The cross section of a five-meter trough is an isosceles trapezoid with a two-meter lower base, a three-meter upper base, and an altitude of 2 meters. Water is running into the trough at a rate of 1 cubic meter per minute. How fast is the water level rising when the water is 1 meter deep?

(12%)