

科目：微積分 適用：科院聯二

編號：401

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。

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1. Find the limit

$$(a) \lim_{x \rightarrow 0} \frac{\sqrt{4+x}-2}{x} \quad (8\%) \quad (b) \lim_{x \rightarrow 1^+} \left(\frac{2}{\ln x} - \frac{2}{x-1} \right) \quad (8\%)$$

2. Find

$$(a) \int_0^\infty \int_0^\infty \frac{1}{(1+x^2+y^2)^2} dx dy \quad (8\%)$$

$$(b) \int_{-3}^3 \int_{-\sqrt{9-x^2}}^{\sqrt{9-x^2}} \int_{x^2+y^2}^9 \sqrt{x^2+y^2} dz dy dx \quad (8\%)$$

3. The edges of a cube are expanding at a rate of 5 centimeters per second. How fast is the surface area changing when each edge is 4.5 centimeters? (8%)

4. Find the dimensions of the rectangle of maximum area, with sides parallel to the coordinate axes, that can be inscribed in the ellipse given by

$$\frac{x^2}{144} + \frac{y^2}{16} = 1 \quad (12\%)$$

5. The work done by a variable force in a press is 80 foot-pounds. The press moves a distance of 4 feet and the force is a quadratic of the form $F = ax^2$. Find a . (12%)

6. The region bounded by the graphs of $y = 2\sqrt{x}$, $y = 0$, and $x = 3$ is revolved about the x -axis. Find the surface area of the solid generated. (12%)

7. A ball is dropped from a height of 8 meters. Each time it drops h meters, it rebounds $0.7h$ meters. Find the total distance traveled by the ball. (12%)

8. The legs of a right triangle are measured to be 5 centimeters and 12 centimeters, with a possible error of $\frac{1}{2}$ centimeter. Approximate the maximum possible error in computing the length of the hypotenuse. Approximate the maximum percent error. (12%)