

※ 考生請注意：本試題不可使用計算機。請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

1. (20%) Find the following integrals

(a) $\int_0^2 \frac{x}{\sqrt{4x+1}} dx$

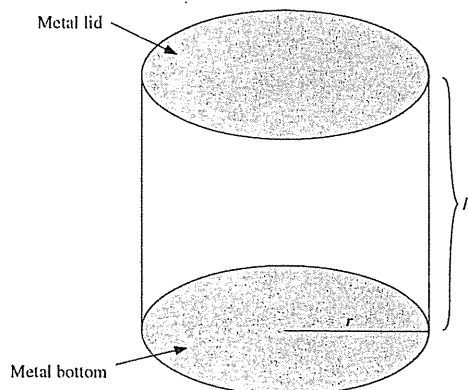
(b) $\int_1^e \frac{\ln x}{x^2} dx$

2. (20%) Solve the initial value problems

(a) $\frac{dy}{dx} = (x^3 + 1)y^2$; $y = 1$ whenever $x = 2$.

(b) $\frac{dy}{dt} = \frac{\sin(2t)}{y^2}$; $y(0) = 1$

3. (20%) A cylindrical can is to hold $8\pi \text{ cm}^3$ of fruit juice. The cost per square centimeter to manufacture the metal lid and bottom is three times the cost per square centimeter of manufacturing the cardboard side. What are the dimensions of the cheapest can?



4. (20%) What is the probability that the quadratic equation $x^2 + bx + c = 0$ has real roots? $|b| \leq 1$ and

$|c| \leq 1$.

5. (20%) Sketch the graph for function $f(x) = 2x^4 - 4x^2 - 3$ using the second derivative test.