



思考练习:

1、 $\mathcal{L}[f'(t)] = pf(p) - f(0)$

2、 $\mathcal{L}[f''(t)] = p^2 \tilde{f}(p) - pf(0) - f'(0)$

3、 $\mathcal{L}^{-1}[e^{-\tau p} \tilde{f}(p)] = f(t)H(t - \tau)$

4、
$$\begin{cases} u_{xy} = x^2 y, & x > 1, y > 0 \\ u(x, 0) = x^2, & x \geq 1 \\ u(1, y) = \cos y, & y \geq 0 \end{cases}$$
 关于 y 实行Laplace变换, 则原

定解问题可化为_____

解: 关于 y 作Laplace变换, 其中

$$\mathcal{L}[u_{xy}] = (\mathcal{L}[u_y])_x = [p\tilde{u}(x, p) - u(x, 0)]_x$$

$$= [p\tilde{u}(x, p) - x^2]_x = p\tilde{u}_x(x, p) - 2x$$

由例题3.4.1的结论可知 $\mathcal{L}[\cos y] = \frac{p}{1+p^2}$, $\mathcal{L}[y] = \frac{1}{p^2}$ 原定解问题可化为

$$\begin{cases} \frac{\partial \tilde{u}}{\partial x} = \frac{2x}{p} + \frac{x^2}{p^3} \\ \tilde{u}(1, p) = \frac{p}{1+p^2} \end{cases}$$

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