## A unified approach to singular problems arising in the membrane theory

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First, the existence and localization of positive solutions of the singular problem

$$(t^{n}u')' + t^{n}f(t,u) = 0, (1)$$

$$\lim_{t \to 0+} t^n u'(t) = 0, \quad a_0 u(1) + a_1 u'(1-) = A,$$
(2)

is studied. Here we assume that  $n \in N$ ,  $n \geq 2$ ,  $a_0 \in (0, \infty)$ ,  $a_1, A \in [0, \infty)$ , and  $f : (0, 1] \times (0, \infty) \to R$  is continuous and can have a time singularity at t = 0 and a space singularity at x = 0. General existence theorems for problem (1), (2) which also discuss a behaviour of solutions at the singular points t = 0 and t = 1 are presented.

Then the application of the theorems on various singular problems arising in the theory of shallow membrane caps is shown. Specially equation (1) for  $f(t,x) = \frac{1}{8x^2} - \frac{\mu}{x} - \frac{\lambda^2}{2}t^{2\gamma-4}$  and for  $f(t,x) = q(t)\frac{1}{u^2}$  is considered. The application of the theorems on an infinite interval problem is shown, as well.