ME 303 Advanced Engineering Mathematics

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Ordinary Differential Equations in Circular Cylinder Coordinates

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When certain partial differential equations formulated in circular cylinder (polar) coordinates are separated by the separation of variables method, or the Laplace transform method, one of the following second-order differential equations may appear.

As a review of some second-order ordinary differential equations, obtain the solutions of the following *ODES* using any **CAS** such as: *Mathematica, Maple, Matlab, MathCAD*, etc.

$$\frac{d^2y}{dr^2} + \frac{1}{r}\frac{dy}{dr} = 0 \tag{1}$$

$$\frac{d^2y}{dr^2} + \frac{1}{r}\frac{dy}{dr} = \frac{S}{k} \tag{2}$$

$$\frac{d^2y}{dr^2} + \frac{1}{r}\frac{dy}{dr} = -\frac{S}{k} \tag{3}$$

$$\frac{d^2y}{dr^2} + \frac{1}{r}\frac{dy}{dr} + \lambda^2 y = 0 \tag{4}$$

$$\frac{d^2y}{dr^2} + \frac{1}{r}\frac{dy}{dr} - \lambda^2 y = 0 \tag{5}$$