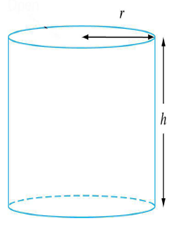
**Applications**

**1. Designing a cylindrical vessel using fmincon**

*Find the optimum value of height (h) and radius (r) of a cylinder to minimize its surface area such that it can hold a volume of 10 units*



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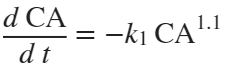
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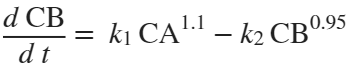
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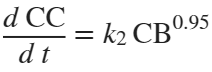
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**2. Using ODE45 for Chemical Reactor Simulation**

*Compositions of three components (A, B, and C) in a reactor can be given by the following differential equations,*







A -----> B ------> C

*Initial Conditions: at t = 0, CA=1; CB=0; CC=0. Solve the differential equations for the time span from t = 0 to 10 units.*

**3. Designing volume of a PFR**

Consider a liquid phase reaction, AàProduct. If the molar feed of A (FA0) to the PFR is 2 mol/s, what PFR volume is necessary to achieve 80% conversion? Note that the PFR design equation and the kinetic data are as follows

