Assignment for ODE with b.c.

Problem 1:

- Solve the boundary value problem shown below. Compare to $y=\sin^2(x)$

$$\frac{d^2y}{dx^2} = 2 - \frac{4y^2}{\sin^2 x}$$
$$\frac{dy}{dx}(1) = 2\sin(1)\cos(1)$$
$$y(2) = \sin^2(2)$$

Problem 2:

- A 1 W, 2 Mohm resistor which is 30 mm long has a radius of 1 mm. Determine the peak temperature if the outside surface is held at room temperature.
- Use k=0.1 W/m-K and Q=2.1 MW/m^2

$$\frac{d^2T}{dr^2} + \frac{1}{r}\frac{dT}{dr} + \frac{Q}{k} = 0$$
$$T(R) = 20\ C$$
$$\frac{dT}{dr}(0) = 0$$

Problem 3:

- Repeat the previous problem with convection to external environment.
- Use k=0.1 W/m-K and Q=2.1 MW/m^2
- Also,h=10 W/m^2-K and T_e=20 C

$$\frac{d^2T}{dr^2}+\frac{1}{r}\frac{dT}{dr}+\frac{Q}{k}=0$$

$$h\left(T(R)-T_e\right)=\frac{1}{2}QR$$

$$\frac{dT}{dr}(0)=0$$