

✓ (4) Surface temp (1.0/1.0)

$$r_1 r = 1.2963(1) \rightarrow J_0(1.2963) = 0.6221$$

$$\theta(1) = (0.1111)(0.6221) = 0.06912$$

$$T(r_0, 1338) = T_{\infty} + \theta(1)(T_i - T_{\infty})$$

$$25 + 0.06912(70 - 25) = \boxed{28.11^\circ\text{C}}$$

(6) -0.01

✓ Summary

There is a small internal temp gradient from the 30° center to 28.11°C . The half radius is a temp of 29.49°C & the rod diameter is 20.22 mm .

✓ Materials

• Solid plastic rod $\rho = 1190\text{ kg/m}^3$

$c_p = 1465\text{ J/kg}\cdot\text{K}$ $k = 0.19\text{ W/m}\cdot\text{K}$

• Cooled fluid @ 25°C $h = 2042\text{ W/m}^2\cdot\text{K}$

• Thermocouple @ centerline 30°

✓ Analysis

After performing calculations, it can be proved that the temp ranges from 30 to 28.11 at the center to the surface. This small variation is due to a low thermal conductivity & Bi number. If the fluid was increased the convective coefficient would raise the Bi, increasing a temp