from before:

$$\dot{m} = \frac{0.6847}{\sqrt{287 \frac{m^2}{s^2 K}}} \frac{973,266.5 \frac{kg}{m s^2}}{\sqrt{223.26 K \, \tau_\lambda}} 0.5 m^2$$

$$\dot{m} = \frac{1316.3}{\sqrt{\tau_\lambda}} \, kg/s$$

then

$$\frac{\dot{m}_f}{\dot{m}} = \frac{c_p T_o}{h} \left(\tau_\lambda - \tau_r \right)$$

$$\frac{5.075 \, kg/s}{1316.3 / \sqrt{\tau_\lambda} \; kg/s} = \frac{1004.9 \frac{J}{kg K} 223.26 K}{4.4 \times 10^7 \frac{J}{kg}} \left(\tau_\lambda - 2.8 \right)$$

$$\sqrt{\tau_\lambda} = 1.3225 \left(\tau_\lambda - 2.8 \right)$$

$$1.3225 \, \tau_\lambda - \sqrt{\tau_\lambda} - 3.703 = 0$$

$$\sqrt{\tau_\lambda} = \frac{1 \pm \sqrt{1 + 4(1.3225)(3.703)}}{2(1.3225)}$$

$$\sqrt{\tau_\lambda} = \frac{1 \pm 4.5375}{2.645}$$ ← have to use positive root

$$\boxed{\tau_\lambda = 4.383}$$