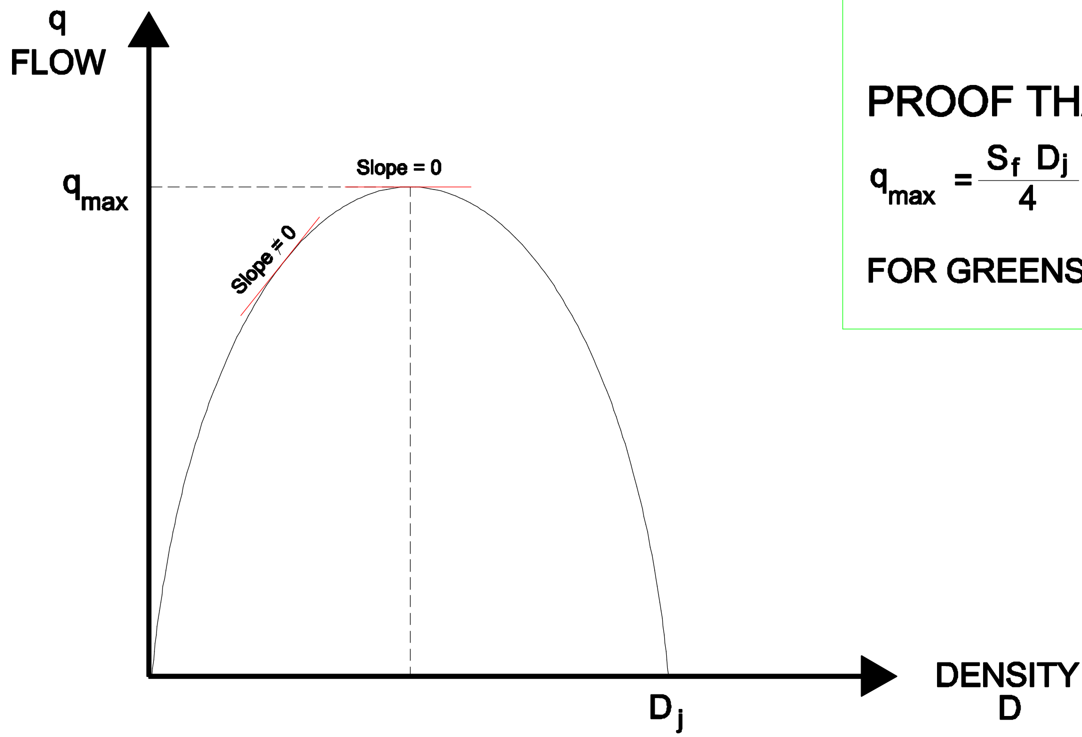
PROOF THAT

$$q_{max} = \frac{S_f\ D_j}{4}$$

FOR GREENSHIELD'S EQUATIONS



$$q = S_f\left(D - \frac{D^2}{D_j}\right) \implies q = S_f D - \frac{S_f D^2}{D_j}$$

WHERE S_f & D_j ARE CONSTANTS

AT q_{max} : $\frac{dq}{dD} = 0 \implies \frac{dq}{dD} = S_f - \frac{2S_f D}{D_j} = 0 \implies S_f = \frac{2S_f D}{D_j} \implies 1 = \frac{2D}{D_j} \implies D_j = 2D$

AT q_{max} : $D = \frac{D_j}{2}$

$$q_{max} = S_f\left(\frac{D_j}{2} - \frac{\left(\frac{D_j}{2}\right)^2}{D_j}\right)$$

$$q_{max} = S_f\left(\frac{D_j}{2} - \frac{D_j}{4}\right) \implies q_{max} = S_f\left(\frac{D_j}{4}\right) = \frac{S_f D_j}{4}$$