$M = K(F)\,F\,d$

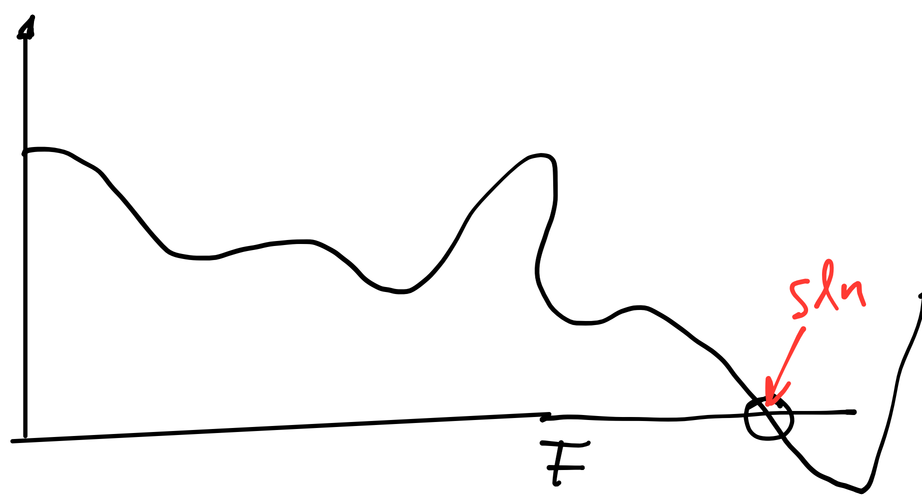
$M = 40\ \text{N.m} \qquad F = ? \qquad d = 12\ \text{mm}$

$$40 = \left(0.18 + 0.0005F^{0.6}\right)F\,d$$

$$40 = \left(0.18Fd + 0.0005F^{1.6}\right)$$

$f(F) = 40 - \left(0.18Fd + 0.0005F^{1.6}\right)$

$f(F) = 0$



Newton-Raphson

$$f(x+h) \approx f(x) + hf'(x) + \cdots = 0$$

$$f(x) + hf'(x) = 0$$

$$h = -\frac{f(x)}{f'(x)} \qquad x_{sln} = x + h$$

$X_0 =$ supuesto

$$X_1 = X_0 + h \qquad h = \frac{-f(X_0)}{f'(X_0)}$$

$$X_2 = X_1 + h \qquad h = \frac{-f(X_1)}{f'(X_1)}$$

$$X_3 = X_2 + h \qquad h = \frac{-f(X_2)}{f'(X_2)}$$

$$\vdots$$

$$M = K(F) \cdot F \cdot d$$

$$f(F) = M - K(F) \cdot F \cdot d = 0$$

$$\frac{df}{dF} = 0 - K(F) \cdot d - \frac{dK}{dF} F \cdot d$$

$$1.8 - \frac{1}{M}\left[\frac{2}{\gamma+1}\left(1+\frac{\gamma-1}{2}M^2\right)\right]^{\frac{\gamma+1}{2(\gamma-1)}} = 0$$

$$f(M) = 0$$

$$f(M+\Delta M) = f(M) + f'(M)\Delta M + \frac{f''(M)\Delta M^2}{2!} + \cdots$$

$$f(M+\Delta M) \approx f(M) + f'(M)\Delta M = 0$$

$$\Delta M = -\frac{f(M)}{f'(M)}$$

$$M^{(0)} \longrightarrow \Delta M = -\frac{f(M^{(0)})}{f'(M^{(0)})} \longrightarrow M^{(1)} = M^{(0)} + \Delta M$$

$$M^{(2)} = M^{(1)} - \frac{f(M^{(1)})}{f'(M^{(1)})}$$

Newton-Raphson

$$M^{(3)} = M^{(2)} - \frac{f(M^{(2)})}{f'(M^{(2)})}$$

$$f'(M) = 1.8 - \frac{1}{M}\left[\frac{2}{\gamma+1}\left(1+\frac{\gamma-1}{2}M^2\right)\right]^{\frac{\gamma+1}{2(\gamma-1)}}$$

$$M^{-2}\left[\frac{2}{\gamma+1}\left(1+\frac{\gamma-1}{2}M^2\right)\right]^{\frac{\gamma+1}{2(\gamma-1)}} -$$

$$-\frac{1}{M}\left(\frac{\gamma+1}{2(\gamma-1)}\left[\frac{2}{\gamma+1}\left(1+\frac{\gamma-1}{2}M^2\right)\right]^{\frac{3-\gamma}{2(\gamma-1)}}\left(\frac{2}{\gamma+1}\right)(\gamma-1)M\right)$$