

$$(b) \quad N = 10^4$$

$$a = \left(\frac{0.9 S_{max}}{0.5 S_{max}} \right)^2 = \left[\frac{(0.9)(95)}{47.5} \right]^2 = \underline{153.9 \text{ kpsi}}$$

$$b = \frac{1}{3} \log_{10} \left(\frac{0.5}{0.9} \right) = -0.0851$$

$$S_f = a N^b = (153.9)(10^4)^{-0.0851}$$

$$= 70.3 \text{ kpsi}$$

$$(c) \quad S_f = a N^b$$

$$\log_{10} S_f \iff \log_{10} a + b \log_{10} N$$

$$\log_{10} N = \frac{\log_{10}(S_f) - \log_{10}(a)}{b}$$

$$\log_{10} N = x$$

$$\Leftrightarrow 10^x = N$$

$$N = 10^{\left(\frac{\log_{10}(S_f) - \log_{10}(a)}{b} \right)}$$

$$N = 10 \left(\frac{\log_{10}(55) - \log_{10}(153.9)}{-0.0851} \right)$$

$$\underline{N = 1.78 \times 10^5 \text{ cycles}}$$

$$S_f = \underbrace{a N^b}_{\substack{\uparrow \\ \text{kpsi}}}$$

$$N \uparrow \quad S_f \downarrow$$