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$$m - M = 5\log_{10} D - 5$$

$$\Rightarrow m = 5\log_{10} D + C \Rightarrow D \propto 10^{\frac{m}{5}}$$

$$n(m)\,dm \propto 4\pi D(m)^2\, dD$$

$$\propto 10^{\frac{2m}{5}}\, d\left(10^{\frac{m}{5}}\right) \propto 10^{\frac{2m}{5}}\, d\left(e^{\ln 10 \frac{m}{5}}\right)$$

$$\propto 10^{\frac{2m}{5}}\, 10^{\frac{m}{5}}\, dm$$

$$\Rightarrow n(m) \propto 10^{\frac{3m}{5}}$$