Firstly recall $\mathcal{M} = \frac{(M_1 M_2)^{3/5}}{M^{1/5}}$

Then use $E = -\frac{1}{2}\frac{G M_1 M_2}{a} = -\frac{1}{2}\frac{G^{2/3} M_1 M_2}{M^{1/3}}\Omega^{2/3}$

$$\Rightarrow \quad \dot{E} = -\frac{1}{3}\frac{G^{2/3} M_1 M_2}{M^{1/3}}\Omega^{-1/3}\dot{\Omega}$$

$$L_{GW} = \frac{32}{5}\frac{G^{7/3}}{c^5}\frac{M_1^2 M_2^2}{M^{2/3}}\Omega^{10/3} \Big\} \text{ quadrupole}$$

$$\Rightarrow \quad \dot{\Omega} = \frac{96}{5}\frac{G^{5/3}}{c^5}\mathcal{M}^{5/3}\Omega^{11/3}$$

Then change our notation ...

$$\dot{\omega} = q\,\omega^{11/3}$$

$$\int \omega^{-11/3}\,d\omega = q\int dt$$

$$\Rightarrow \quad \frac{3}{8}\omega^{-8/3} = q\tau \Big\} \rightarrow \tau \to 0 \text{ as } \omega \to \infty$$

note pole is removed by strong gravity.

Then $q = \frac{96}{5}\frac{G^{5/3}\mathcal{M}^{5/3}}{c^5}$

$$q = \frac{3}{8}\tau^{-1}\omega^{-8/3} \Big\} \text{ great!}$$