

$$\begin{aligned}
m_2(3 \mid M_2) &= \int_0^1 \binom{11}{3} \pi^3 (1-\pi)^8 \frac{\Gamma(4.4)}{\Gamma(2.4)\Gamma(2)} \pi^{2.4-1} (1-\pi)^{2-1} d\pi \\
&= \binom{11}{3} \frac{\Gamma(4.4)}{\Gamma(2.4)\Gamma(2)} \int_0^1 \pi^{5.4-1} (1-\pi)^{10-1} d\pi \\
&= \frac{11!}{3!8!} \frac{\Gamma(4.4)}{\Gamma(2.4)\Gamma(2)} \frac{\Gamma(5.4)\Gamma(10)}{\Gamma(15.4)} \\
&= 0.08528986
\end{aligned}$$