$$
\begin{aligned}
\int_1^\infty \frac{4^{x-1}}{6^{x-1}} + \frac{3^x}{6^{x-1}}\, dx &= \int_1^\infty \left(\frac{2}{3}\right)^{x-1} + 3\left(\frac{1}{2}\right)^{x-1} dx \\
&= \int_1^\infty \frac{3}{2}\left(\frac{2}{3}\right)^{x} + 6\left(\frac{1}{2}\right)^{x} dx \\
&= \frac{3}{2}\frac{\left(\frac{2}{3}\right)^x}{\ln(\frac{2}{3})} + 6\frac{\left(\frac{1}{2}\right)^x}{\ln(\frac{1}{2})}\Bigg|_1^\infty \\
&= -\left[\frac{1}{\ln(\frac{2}{3})} + \frac{3}{\ln(\frac{1}{2})}\right]
\end{aligned}
$$