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Quiz – September 17, 2004

Find $\int \frac{e^{3t}}{\sqrt{4 - e^{6t}}} dt$. **CHECK YOUR ANSWER.**

Answer: The integral is equal to

$$\int \frac{e^{3t}}{2\sqrt{1 - \frac{e^{6t}}{4}}} dt.$$

Let $u = \frac{e^{3t}}{2}$. It follows that $du = \frac{3e^{3t}}{2} dt$, or $\frac{2}{3} du = e^{3t} dt$. Thus, the original problem is

$$\frac{2}{3} \frac{1}{2} \int \frac{1}{\sqrt{1-u^2}} du = \frac{1}{3} \arcsin u + C = \boxed{\frac{1}{3} \arcsin\left(\frac{e^{3t}}{2}\right) + C}.$$

Check. The derivative of the proposed answer is

$$\frac{1}{3} \frac{\frac{3}{2} e^{3t}}{\sqrt{1 - \left(\frac{e^{3t}}{2}\right)^2}} = \frac{e^{3t}}{2\sqrt{1 - \frac{e^{6t}}{4}}} = \frac{e^{3t}}{\sqrt{4 - e^{6t}}}. \checkmark$$