

$$c) \int \ln^5 \frac{3e^{2x}}{\sqrt{e^x-1}} dx$$

$$u = e^x - 1$$

$$\frac{du}{dx} = e^x$$

$$3 \int \frac{e^{2x}}{\sqrt{e^x-1}} dx$$

$$e^{2x} = (u+1)^2$$

$$3 \int (u+1)(u^{\frac{1}{2}}) du$$

$$2u^{\frac{3}{2}}$$

$$u = e^x - 1$$

$$du = e^x dx$$

$$3 \left(2u^{\frac{3}{2}}(u+1) - \int (2u^{\frac{1}{2}}) \right)$$

$$3 \left(2u^{\frac{3}{2}} + 2u^{\frac{1}{2}} - 4u^{\frac{3}{2}} \right)$$

$$3 \left(2u^{\frac{3}{2}} + 2u^{\frac{1}{2}} \right)$$

$$\left[6u^{\frac{3}{2}} + 6u^{\frac{1}{2}} \right]_{\ln^2}$$

$$\left(6(e^{\ln^2} - 1) + 6(e^{\ln^2} - 1)^{\frac{1}{2}} \right) - \left(6(e^{\ln^2} - 1)^{\frac{3}{2}} + 6(e^{\ln^2} - 1)^{\frac{1}{2}} \right)$$

$$(48 + 12) - (6 + 6)$$

$$60$$

$$- 12$$

$$(48)$$