Discussion 7.7

(15) Find y' if $y = 2\sqrt{t}\tanh\sqrt{t}$

$$y' = (2\sqrt{t})(\operatorname{sech}^2\sqrt{t})\left(\frac{1}{2\sqrt{t}}\right) + (\tanh\sqrt{t})\left(2\frac{1}{2\sqrt{t}}\right)$$

$$= \operatorname{sech}^2\sqrt{t} + \frac{1}{\sqrt{t}}\tanh\sqrt{t}$$

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(54) Evaluate

$$\int_0^{\ln 2} 4e^{-\theta}\sinh\theta\, d\theta$$

$$= \int_0^{\ln 2} 4e^{-\theta}\left(\frac{e^{\theta} - e^{-\theta}}{2}\right) d\theta$$

$$= 2\int_0^{\ln 2} (1 - e^{-2\theta})\, d\theta$$

$$= 2\left(\theta + \frac{1}{2}e^{-2\theta}\right)\Big|_0^{\ln 2} = \left(2\theta + e^{-2\theta}\right)\Big|_0^{\ln 2}$$

$$= \left(2\ln 2 + e^{-2\ln 2}\right) - \left(0 + e^{0}\right)$$

$$= \ln 4 + e^{\ln 2^{-2}} - 1$$

$$= \ln 4 + 2^{-2} - 1$$

$$= \ln 4 + \frac{1}{4} - 1 = \ln 4 - \frac{3}{4}$$