~~Page~~ $\boxed{\text{HW \# 9}}$ Solution

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# 28.

$$\lim_{x \to -\infty} \frac{e^{3x} - e^{-3x}}{e^{3x} + e^{-3x}}$$

$$= \lim_{x \to -\infty} \frac{e^{3x}\,(e^{3x} - e^{-3x})}{e^{3x}\,(e^{3x} + e^{-3x})}$$

$$= \lim_{x \to -\infty} \frac{e^{6x} - 1}{e^{6x} + 1} = -1. \ \square$$

# 44.

$$y = \frac{e^{x} + e^{-x}}{e^{x} - e^{-x}}$$

$$y' = \frac{(e^{x} - e^{-x})(e^{x} - e^{-x}) - (e^{x} + e^{-x})(e^{x} + e^{-x})}{(e^{x} - e^{-x})^2}$$

$$= \frac{(e^{x} - e^{-x})^2 - (e^{x} + e^{-x})^2}{(e^{x} - e^{-x})^2}$$

$$= \frac{(e^{x} - \cancel{e^{-x}} + e^{x} + \cancel{e^{-x}})(\cancel{e^{x}} - \overset{e^{-x}}{\cancel{e^{-x}}} - \cancel{e^{x}} - \overset{e^{-x}}{\cancel{e^{-x}}})}{(e^{x} - e^{-x})^2}$$

$$= \frac{-2e^{x} \cdot 2e^{-x}}{(e^{x} - e^{-x})^2}$$

$$= -\frac{4}{(e^{x} - e^{-x})^2} \ \square$$

#74. $\int \frac{e^{1/x}}{x^2}\,dx.$

put $u = \frac{1}{x}$

$du = -\frac{1}{x^2}\,dx$

$-\int e^u\,du = -e^u + c = -e^{1/x} + c.$ $\square$

# 76. $\int e^x \sin(e^x)\,dx.$

put $u = e^x$ $du = e^x dx$

$\int \sin u\,du = -\cos u + c = -\cos e^x + c.$ $\square$

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#36. $y = x^{\ln x}.$

$\ln y = \ln x^{\ln x}$

$\ln y = \ln x \ln x.$

$\ln y = (\ln x)^2$

$\frac{1}{y} y' = 2 \ln x \cdot \frac{1}{x}$

$y' = 2 \ln x \frac{1}{x} x^{\ln x},$

$y' = \frac{2}{x} \cdot \ln x \; x^{\ln x}$ $\square$

#46. $\int \frac{2^x}{2^x+1}\,dx$

$u = 2^x+1$ $du = 2^x \ln 2\,dx.$

$\int \frac{1}{u \ln 2}\,du.$

$= \frac{1}{\ln 2} \int \frac{1}{u}\,du.$

$= \frac{1}{\ln 2} \ln|u| + C.$

$= \frac{1}{\ln 2} \ln|2^x+1| + C.$

$\square$