5.4 (HW) p. 346 #75-85: odd, #89

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#75 $\int e^{5x}(5)\,dx$ Let $u = 5x$, $du = 5dx$

$= \int e^u du = e^u + C$

$= e^{5x} + C$

#77 $\int_0^1 e^{-2x}\,dx = -\frac{1}{2}\int_0^1 e^{-2x}(-2)\,dx$

$= -\frac{1}{2}\left[e^{-2x}\right]_0^1$

$= -\frac{1}{2}\left[e^{-2} - e^0\right]$

$= \frac{1}{2}\left[1 - e^{-2}\right]$

$= \frac{e^2 - 1}{2e^2}$

#79 $\int \frac{e^{-x}}{1+e^{-x}}\,dx$

Let $u = 1 + e^{-x}$

$du = -e^{-x}\,dx$

$= -\int \frac{-e^{-x}}{1+e^{-x}}\,dx$

$= -\int \frac{1}{u}\,du = -\ln|u| + C$

$= -\ln(1+e^{-x}) + C$

$= -\ln\left(\frac{e^x+1}{e^x}\right) + C$

$= \ln\left(\frac{e^x}{e^x+1}\right) + C$

$= \ln(e^x) - \ln(e^x+1) + C$

$= x - \ln(e^x+1) + C$

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#81 $\int_1^3 \frac{e^{3/x}}{x^2}\,dx$

Let $u = \frac{3}{x}$

Then $du = -\frac{3}{x^2}\,dx$

$= -\frac{1}{3}\int_1^3 \left(\frac{3}{x^2}\right)\left(e^{3/x}\right)dx$

$= -\frac{1}{3}\int_1^3 e^u\,du$

$= -\frac{1}{3}e^u + C = -\frac{1}{3}e^{3/x}\Big]_1^3 = -\frac{1}{3}\left[e^1 - e^3\right]$

$= \frac{1}{3}(e^3 - e) = \frac{e}{3}(e^2 - 1)$

#83 $\int e^x\sqrt{1-e^x}\,dx$

Let $u = 1 - e^x$

$du = -e^x\,dx$

$= -\int (1-e^x)^{1/2}(-e^{-x})\,dx$

$= -\frac{(1-e^x)^{3/2}}{3/2} + C$

$= -\frac{2}{3}(1-e^x)^{3/2} + C$

#85 $\int \frac{e^x + e^{-x}}{e^x - e^{-x}}\,dx$

Let $u = e^x - e^{-x}$

$du = (e^x + e^{-x})\,dx$

$= \ln|e^x - e^{-x}| + C$

#89 $\int e^{\sin \pi x}\cos \pi x\,dx$

$= \frac{1}{\pi}\int e^{\sin \pi x}(\pi \cos \pi x)\,dx$

$= \frac{1}{\pi}e^{\sin \pi x} + C$