Tuesday, January 15, 2019 9:34 AM

34 $\int x^3 e^{x^2} dx$

$u = x^2$

$du = 2x\, dx$

$\frac{1}{2x} du = dx$

$\frac{1}{2} \int x^2 e^u du$

$\frac{1}{2} \int u e^u du$

$w = u \quad dy = e^u du$

$dw = du \quad y = e^u$

$\to u e^u - \int e^u du$

$u e^u - e^u$

$\frac{1}{2}\left(x^2 e^{x^2} - e^{x^2}\right) + C$

28 $\int (\sin x)\, 5^{-x}\, dx$

LIPET

$u = 5^{-x} \quad dv = \sin x$

$du = \ln 5 \cdot 5^{-x} \quad v = -\cos x$

$= -5^{x} \cos x - \ln 5 \int (-\cos x)\, 5^{-x}\, dx$

$= -5^{-x} \cos x + \ln 5 \underbrace{\int \cos x\, 5^{-x}\, dx}$

$u = 5^{-x} \quad dv = \cos x$

$du = 5^{x} \ln 5 \quad v = \sin x$

$= 5^{x} \sin x - \ln 5 \int \sin x\, 5^{x}\, dx$

$= -5^{-x} \cos x + \ln 5 \left(5^{-x} \sin x - \ln 5 \int \sin x\, 5^{-x}\, dx \right)$

$= -5^{x} \cos x + \ln 5 \cdot 5^{-x} \sin x - (\ln 5)^2 \int 5^{-x} \sin x\, dx$

$\int 5^{-x} \sin x\, dx + (\ln 5)^2 \int 5^{x} \sin x\, dx = \ln 5 \cdot 5^{x} \sin x - 5^{x} \cos x$

$$\int 5^{x} \sin x\, dx = \frac{\ln 5 \cdot 5^{-x} \sin x - \cos x \cdot 5^{x}}{1 + (\ln 5)^2}$$

41 $\int \sin\sqrt{x}\, dx$

$u = \sqrt{x}$

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

$2\sqrt{x}\, du = dx$

$2\int \sqrt{x} \sin u\, du$

$2\int u \sin u\, du$

$2\int u \sin u\, du$

$w = u \quad dy = \sin u\, du$

$dw = du \quad y = -\cos u$

$= -u\cos u - \int -\cos u\, du$

$= -u\cos u + \int \cos u\, du$

$= -u\cos u + \sin u$

$= 2\left(-\sqrt{x}\cos\sqrt{x} + \sin\sqrt{x}\right)$