

$$EX1 \quad \frac{3\pi}{2}$$

$$\frac{1}{\frac{3\pi}{2}} \int_0^{\frac{3\pi}{2}} 5 \cos t \sin t dt = \frac{5}{3\pi} \int_0^{\frac{3\pi}{2}} 2 \sin t \cos t dt =$$

$$\frac{5}{3\pi} \int_0^{\frac{3\pi}{2}} \sin 2t dt = \frac{5}{6\pi} \left[-\cos 2t \right]_0^{\frac{3\pi}{2}} =$$

$$\frac{5}{6\pi} \left[-(-1) + 1 \right] = \frac{5}{3\pi}$$

$$\int_0^{\infty} x e^{-2x} dx$$

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$$t = e^{-x}$$

$$\ln t = -x \quad x = -\ln t$$

$$x=0 \quad t=1$$

$$[0, \infty) \rightarrow (0, 1]$$

$$x \rightarrow +\infty \quad t \rightarrow 0$$

$$dx = -\frac{1}{t} dt$$

$$\int_0^{\infty} \underline{\underline{x e^{-2x}}} \underline{\underline{dx}} = \int_1^0 \underline{\underline{(-\ln t)}} \underline{\underline{t^2}} \underline{\underline{\left(-\frac{1}{t}\right) dt}} = \int_1^0 t \ln t dt$$

$$-\int_0^1 t \ln t dt$$

$$\begin{matrix} a=0 \\ b=1 \end{matrix}$$

Tc / CS comp.

$$I_k = \int_0^1 x^k e^{x-1} dx \quad k = 1, 2, 3, \dots$$

$$I_1 = \int_0^1 x e^{x-1} dx = x e^{x-1} \Big|_0^1 - \int_0^1 e^{x-1} dx =$$

$$1 - [e^{x-1}]_0^1 = \cancel{1} - \cancel{e} + e^{-1} = \frac{1}{e}$$

$$I_k = 1 - k I_{k-1}$$

$$I_k + k I_{k-1} \stackrel{TS}{=} \boxed{1}$$

$$\int_0^1 x^k e^{x-1} dx + k \int_0^1 x^{k-1} e^{x-1} dx =$$

$$\left[x^k e^{x-1} \right]_0^1 - \int_0^1 k x^{k-1} e^{x-1} dx + k \int_0^1 x^{k-1} e^{x-1} dx =$$

$$\boxed{1}$$

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