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20/20

H.W.

Suppose $\int_0^2 g(t)\,dt = 5$

p. 319 (76)

(a) $\int_0^4 g(t/2)\,dt$ $\quad w = t/2$ $\quad 0/2 = 0,\ 4/2 = 2 = \int_0^2$

$dw = 1/2\,dt$

$2\,dw = dt$

$\int_0^2 g(t)\,2\,dw = 2\int_0^2 g(t)\,dt = 2(5) = \boxed{10}$

(b) $\int_0^2 g(2-t)\,dt$

$w = 2-t$ $\quad 2-2=0,\ 2-0=2$

$dw = -1\,dt$

$dw+1 = dt$

$\int_0^2 g(t)\,dw+1 = \int_0^2 g(t)\,dt = \boxed{5}$

(78) (a) calculate $\int_{-\pi}^{\pi} \cos^2\theta \sin\theta\, d\theta = \int_{-\pi}^{\pi} \cos\theta\cdot\cos\theta\cdot\sin\theta\, d\theta$

$w = \cos\theta$

$dw = -\sin\theta\, d\theta$

$d\theta = \dfrac{dw}{-\sin\theta}$

$-\int_{-\pi}^{\pi} w^2\, dw = -\left(\dfrac{w^3}{3}\right) = -\dfrac{\cos^3\theta}{3}\Bigg|_{-\pi}^{\pi}$

$= \dfrac{-(\cos^3\pi)}{3} - \left(\dfrac{-\cos^3\pi}{3}\right) = \dfrac{1}{3} - \dfrac{1}{3} = \boxed{0}$

(b) $-\dfrac{\cos^3\theta}{3}\Bigg|_0^{\pi} = \dfrac{-(\cos^3\pi)}{3} - \left(\dfrac{-\cos^3 0}{3}\right) = \dfrac{1}{3} + \dfrac{1}{3} = \boxed{\dfrac{2}{3}}$

p. 325 (42) $\int e^x \sin x \, dx$ let $u = e^x$ $u' = e^x$
$v' = \sin x$ $v = -\cos x$

$I_1 = \int e^x \sin x \, dx = e^x(-\cos x) - \boxed{\int e^x(-\cos x)\, dx} = I_2$

$I_2 = \int e^x(-\cos x)\, d\theta$ $u = e^x$ $u' = e^x$
$v' = -\cos x$ $v = -\sin x$

$I_2 = -e^x \sin x - \int e^x(-\sin x)\, dx$

$-e^x \cos x - [-e^x \sin x + \int e^x \sin x \, dx$

$-e^x \cos x + e^x \sin x + I_1$

$2I_1 = -e^x \cos x + e^x \sin x$

$\boxed{I = -\frac{1}{2} e^x(\cos x - \sin x) + C}$ ✓

(46) $\int x^n e^x \, dx = x^n e^x - n\int x^{n-1} e^x \, dx$ $\boxed{\text{let } u = x^n \quad u' = nx^{n-1} \quad v' = e^x \quad v = e^x}$

Integration by parts.

$x^n e^x - \int n x^{n-1} e^x \, dx = x^n e^x - n\boxed{\int x^{n-1} e^x \, dx}$

Let $u = x^{n-1}$ $u' = n-1 x^{n-2}$ ✓
$v' = e^x$ $v = e^x$

$x^{n-1} e^x - \int n-1 x^{n-2} e^x \, dx$