*Stewart Calculus ET 5e 0534393217;6. Application of Integration; 6.3 Volumes by Cylindrical Shells*

38. Use shells:

$$V = \int_1^2 2\pi x\left(-x^2+3x-2\right)dx = 2\pi\int_1^2\left(-x^3+3x^2-2x\right)dx$$

$$= 2\pi\left[-\frac{1}{4}x^4+x^3-x^2\right]_1^2 = 2\pi\left[(-4+8-4)-\left(-\frac{1}{4}+1-1\right)\right] = \frac{\pi}{2}$$

*Stewart Calculus ET 5e 0534393217;7. Techniques of Integration; 7.1 Integration by Parts*

33. Let $w=\sqrt{x}$, so that $x=w^2$ and $dx=2w\,dw$. Thus, $\int \sin\sqrt{x}\,dx=\int 2w\sin w\,dw$. Now use parts with $u=2w$, $dv=\sin w\,dw$, $du=2\,dw$, $v=-\cos w$ to get

$$\int 2w\sin w\,dw = -2w\cos w+\int 2\cos w\,dw=-2w\cos w+2\sin w+C$$

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

*Stewart Calculus ET 5e 0534393217;7. Techniques of Integration; 7.2 Trigonometric Integrals*

66. $\int_{-\pi}^{\pi}\sin mx\sin nx\,dx=\int_{-\pi}^{\pi}\frac{1}{2}[\cos(m-n)x-\cos(m+n)x]\,dx$. If $m\neq n$, this is equal to $\frac{1}{2}\left[\frac{\sin(m-n)x}{m-n}-\frac{\sin(m+n)x}{m+n}\right]_{-\pi}^{\pi}=0$. If $m=n$, we get

$\int_{-\pi}^{\pi}\frac{1}{2}[1-\cos(m+n)x]\,dx=\left[\frac{1}{2}x\right]_{-\pi}^{\pi}-\left[\frac{\sin(m+n)x}{2(m+n)}\right]_{-\pi}^{\pi}=\pi-0=\pi$.