Integral Garis:

In Problems 19–24, find the work done by the force field **F** *in moving a particle along the curve C.*

19. $\mathbf{F}(x, y) = (x^3 - y^3)\mathbf{i} + xy^2\mathbf{j}$; C is the curve $x = t^2$, $y = t^3$, $-1 \le t \le 0$.

20. $\mathbf{F}(x, y) = e^x\mathbf{i} - e^{-y}\mathbf{j}$; C is the curve $x = 3 \ln t$, $y = \ln 2t$, $1 \le t \le 5$.

21. $\mathbf{F}(x, y) = (x + y)\mathbf{i} + (x - y)\mathbf{j}$; C is the quarter-ellipse, $x = a \cos t$, $y = b \sin t$, $0 \le t \le \pi/2$.

22. $\mathbf{F}(x, y, z) = (2x - y)\mathbf{i} + 2z\mathbf{j} + (y - z)\mathbf{k}$; C is the line segment from $(0, 0, 0)$ to $(1, 1, 1)$.

23. Same **F** as in Problem 22; C is the curve $x = \sin(\pi t/2)$, $y = \sin(\pi t/2)$, $z = t$, $0 \le t \le 1$.

24. $\mathbf{F}(x, y, z) = y\mathbf{i} + z\mathbf{j} + x\mathbf{k}$; C is the curve $x = t$, $y = t^2$, $z = t^3$, $0 \le t \le 2$.

Independence of Path:

In Problems 13–20, show that the given line integral is independent of path (use Theorem C) and then evaluate the integral (either by choosing a convenient path or, if you prefer, by finding a potential function f and applying Theorem A).

13. $\displaystyle\int_{(-1,2)}^{(3,1)} (y^2 + 2xy)\,dx + (x^2 + 2xy)\,dy$

14. $\displaystyle\int_{(0,0)}^{(1,\pi/2)} e^x \sin y\,dx + e^x \cos y\,dy$

15. $\displaystyle\int_{(2,1)}^{(6,3)} \frac{x^3}{(x^4 + y^4)^2}\,dx + \frac{y^3}{(x^4 + y^4)^2}\,dy$

16. $\displaystyle\int_{(-1,1)}^{(4,2)} \left(y - \frac{1}{x^2}\right) dx + \left(x - \frac{1}{y^2}\right) dy$

17. $\displaystyle\int_{(0,0,0)}^{(1,1,1)} (6xy^3 + 2z^2)\,dx + 9x^2y^2\,dy + (4xz + 1)\,dz$

Hint: Try the path consisting of line segments from $(0, 0, 0)$ to $(1, 0, 0)$ to $(1, 1, 0)$ to $(1, 1, 1)$.

18. $\displaystyle\int_{(0,1,0)}^{(1,1,1)} (yz + 1)\,dx + (xz + 1)\,dy + (xy + 1)\,dz$

19. $\displaystyle\int_{(0,0,0)}^{(-1,0,\pi)} (y + z)\,dx + (x + z)\,dy + (x + y)\,dz$

20. $\displaystyle\int_{(0,0,0)}^{(\pi,\pi,0)} (\cos x + 2yz)\,dx + (\sin y + 2xz)\,dy + (z + 2xy)\,dz$