p.1131 (14.3)

Determine if $\vec{F}$ is conservative. If it is, find a potential function *f*.

5. $\vec{F}(x,y)=\langle 2xy-1, x^2\rangle$
7. $\vec{F}(x,y)=\left\langle \frac{1}{y}-2x, y-\frac{x}{y^2}\right\rangle$
9. $\vec{F}(x,y)=\langle e^{xy}-1, xe^{xy}\rangle$
11. $\vec{F}(x,y)=\langle ye^{xy}, xe^{xy}+\cos y\rangle$
13. $\vec{F}(x,y,z)=\langle z^2+2xy, x^2+1, 2xz-3\rangle$
15. $\vec{F}(x,y,z)=\langle y^2z^2+x, y+2xyz^2, xy^2z\rangle$

Show that the line integral is independent of path and evaluate the integral.

17. $\int_C (2xy)dx+(x^2-1)dy,$ where *C* runs from (1, 0) to (3, 1)
19. $\int_C (ye^{xy})dx+(xe^{xy}-2y)dy,$ where *C* runs from (1, 0) to (0, 4)
21. $\int_C (z^2+2xy)dx+(x^2)dy+(2xz)dz,$ where *C* runs from (2, 1, 3) to (4, -1, 0)

Evaluate $\int_C \vec{F}\cdot d\vec{r}$.

23. $\vec{F}(x,y)=\langle x^2+1, y^3-3y+2\rangle,$ *C* is the top half-circle from (-4, 0) to (4, 0)
25. $\vec{F}(x,y,z)=\langle x^2, y^2, z^2\rangle,$ *C* is the top half-circle from (1, 4, -3) to (1, 4, 3)
27. $\vec{F}(x,y,z)=\frac{\langle x,y,z\rangle}{\sqrt{x^2+y^2+z^2}},$ *C* runs from (1, 3, 2) to (2, 1, 5)
29. $\vec{F}(x,y)=\langle 3x^2y+1, 3xy^2\rangle,$ *C* is the bottom half-circle from (1, 0) to (-1, 0)

Use the graph to determine whether or not the vector field is conservative.

35. (Image in book)
37. (Image in book)
39. (Image in book)

Show that the line integral is not independent of path by finding two paths that give different values of the integral.

41. $\int_C (y)dx-(x)dy,$ where *C* goes from (-2, 0) to (2, 0)
43. $\int_C (y)dx-3dy,$ where *C* goes from (-2, 2) to (0, 0)

Label each statement as True or False and briefly explain.

45. If $\vec{F}$ is conservative, then $\int_C \vec{F} \cdot d\vec{r} = 0$.

46. If $\int_C \vec{F} \cdot d\vec{r}$ is independent of path, then $\vec{F}$ is conservative.

47. If $\vec{F}$ is conservative, then $\int_C \vec{F} \cdot d\vec{r} = 0$ for any closed curve *C*.

48. If $\vec{F}$ is conservative, then $\int_C \vec{F} \cdot d\vec{r}$ is independent of path.

49. Let $\vec{F}(x, y) = \dfrac{1}{x^2 + y^2}\langle -y, x\rangle$. Find a potential function *f* for $\vec{F}$ and carefully note any restrictions on the domain of *f*. Let *C* be the unit circle and show that $\int_C \vec{F} \cdot d\vec{r} = 2\pi$. Explain why the Fundamental Theorem for Line Integrals does not apply to this calculation. Quickly explain how to compose $\int_C \vec{F} \cdot d\vec{r}$ over the circle $(x-2)^2 + (y-3)^2 = 1$.