1–16 Evaluate the line integral, where C is the given curve.

5. $\int_C (x^2y^3 - \sqrt{x})\, dy$,
C is the arc of the curve $y = \sqrt{x}$ from $(1, 1)$ to $(4, 2)$

11. $\int_C xe^{yz}\, ds$,
C is the line segment from $(0, 0, 0)$ to $(1, 2, 3)$

15. $\int_C (x + yz)\, dx + 2x\, dy + xyz\, dz$, C consists of line segments from $(1, 0, 1)$ to $(2, 3, 1)$ and from $(2, 3, 1)$ to $(2, 5, 2)$

23–26 Use a calculator or CAS to evaluate the line integral correct to four decimal places.

23. $\int_C \mathbf{F} \cdot d\mathbf{r}$, where $\mathbf{F}(x, y) = xy\,\mathbf{i} + \sin y\,\mathbf{j}$ and $\mathbf{r}(t) = e^t\,\mathbf{i} + e^{-t^2}\,\mathbf{j}$, $1 \leq t \leq 2$

27–28 Use a graph of the vector field $\mathbf{F}$ and the curve C to guess whether the line integral of $\mathbf{F}$ over C is positive, negative, or zero. Then evaluate the line integral.

27. $\mathbf{F}(x, y) = (x - y)\,\mathbf{i} + xy\,\mathbf{j}$,
C is the arc of the circle $x^2 + y^2 = 4$ traversed counterclockwise from $(2, 0)$ to $(0, -2)$

32. (a) Find the work done by the force field $\mathbf{F}(x, y) = x^2\,\mathbf{i} + xy\,\mathbf{j}$ on a particle that moves once around the circle $x^2 + y^2 = 4$ oriented in the counterclockwise direction.
(b) Use a computer algebra system to graph the force field and circle on the same screen. Use the graph to explain your answer to part (a).

37. If a wire with linear density $\rho(x, y)$ lies along a plane curve C, its **moments of inertia** about the x- and y-axes are defined as

$$I_x = \int_C y^2\rho(x, y)\, ds \qquad I_y = \int_C x^2\rho(x, y)\, ds$$

Find the moments of inertia for the wire in Example 3.

43. A 160-lb man carries a 25-lb can of paint up a helical staircase that encircles a silo with a radius of 20 ft. If the silo is 90 ft high and the man makes exactly three complete revolutions, how much work is done by the man against gravity in climbing to the top?

(Fact: You should discover that the work done against gravity is independent of path.