## 2–11 LINE INTEGRAL. WORK

Calculate $\int_C \mathbf{F}(\mathbf{r}) \cdot d\mathbf{r}$ for the given data. If $\mathbf{F}$ is a force, this gives the work done by the force in the displacement along $C$. Show the details.

2. $\mathbf{F} = [y^2, -x^2]$, $C$: $y = 4x^2$ from (0, 0) to (1, 4)
3. $\mathbf{F}$ as in Prob. 2, $C$ from (0, 0) straight to (1, 4). Compare.
4. $\mathbf{F} = [xy, x^2y^2]$, $C$ from (2, 0) straight to (0, 2)
5. $\mathbf{F}$ as in Prob. 4, $C$ the quarter-circle from (2, 0) to (0, 2) with center (0, 0)
6. $\mathbf{F} = [x - y, y - z, z - x]$, $C$: $\mathbf{r} = [2\cos t, t, 2\sin t]$ from (2, 0, 0) to $(2, 2\pi, 0)$
7. $\mathbf{F} = [x^2, y^2, z^2]$, $C$: $\mathbf{r} = [\cos t, \sin t, e^t]$ from (1, 0, 1) to $(1, 0, e^{2\pi})$. Sketch $C$.
8. $\mathbf{F} = [e^x, \cosh y, \sinh z]$, $C$: $\mathbf{r} = [t, t^2, t^3]$ from (0, 0, 0) to $(\frac{1}{2}, \frac{1}{4}, \frac{1}{8})$. Sketch $C$.
9. $\mathbf{F} = [x + y, y + z, z + x]$, $C$: $\mathbf{r} = [2t, 5t, t]$ from $t = 0$ to 1. Also from $t = -1$ to 1.
10. $\mathbf{F} = [x, -z, 2y]$ from (0, 0, 0) straight to (1, 1, 0), then to (1, 1, 1), back to (0, 0, 0)
11. $\mathbf{F} = [e^{-x}, e^{-y}, e^{-z}]$, $C$: $\mathbf{r} = [t, t^2, t]$ from (0, 0, 0) to (2, 4, 2). Sketch $C$.