1. Find the work done by each $\mathbf{F}$ below from $(0,0,0)$ to $(1,1,1)$ over each of the following paths:
   - The straight line segment.
   - The curve $t\mathbf{i} + t^2\mathbf{j} + t^4\mathbf{k}$
   - First the line segment from $(0,0,0)$ to $(1,1,0)$ and then the line segment from $(1,1,0)$ to $(1,1,1)$

   (a) $\mathbf{F} = 3y\mathbf{i} + 2x\mathbf{j} + 4z\mathbf{k}$

   (b) $\mathbf{F} = (3x^2 - 3)\mathbf{i} + 3z\mathbf{j} + \mathbf{k}$

   (c) $\mathbf{F} = (e^x \cos y)\mathbf{i} - (e^x \sin y)\mathbf{j} + z\mathbf{k}$

   (d) $\mathbf{F} = e^{y+2z}(\mathbf{i} + x\mathbf{j} + 2x\mathbf{k})$

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2. How are each of the following related?

   (a) $\int_\gamma \mathbf{F} \cdot d\mathbf{s}$ and $\int_{-\gamma} \mathbf{F} \cdot d\mathbf{s}$

   (b) $\int_\gamma f\, ds$ and $\int_{-\gamma} f\, ds$

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3. Evaluate $\int_C (x - y)\, dx + (x + y)\, dy$ counterclockwise around the triangle with vertices $(0,0)$, $(1,0)$, and $(0,1)$.

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4. Find the divergence and curl of the vector fields in problem 1.

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5. Given a vector field $\mathbf{F}$, find the divergence of the curl of $\mathbf{F}$. (If you did this on the homework, you do not have to repeat it!)

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6. Consider the field

$$\mathbf{F} = xy\mathbf{i} + y\mathbf{j} - yz\mathbf{k}$$

Find the work done by this vector field from $(0,0,0)$ to $(1,1,1)$ along the curve of intersection of the parabolic cylinder $y = x^2$ and the plane $z = x$. (Hint: Use $t = x$ as the parameter.)

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7. (a) $\displaystyle\int_A^B z^2\,dx + 2y\,dy + 2xz\,dz$

(b) $\displaystyle\int_A^B \frac{x\,dx + y\,dy + z\,dz}{\sqrt{x^2+y^2+z^2}}$