1. $\dfrac{1}{6}(5\sqrt{5}-1)$

2. $\dfrac{(2)4^6}{5}$

3. Yes $\mathbf{F}$ is a conservative vector field and $f(x,y)=xe^{xy}+C$

4. Yes $\mathbf{F}$ is a conservative vector field and $f(x,y)=\dfrac{1}{2}x^2y^2+C$

5. $\dfrac{14}{3}$

6. 36π

7. curl $\mathbf{F}=\mathbf{0}$ and div $\mathbf{F}=y(x^2+z^2)e^{xz}$. Since the curl is the zero vector $\mathbf{F}$ is conservative and $f(x,y,z)=ye^{xz}+C$
8. curl $\mathbf{F}=\mathbf{0}$ and div $\mathbf{F}=-x\sin y-y\cos z$. Since the curl is the zero vector $\mathbf{F}$ is conservative and $f(x,y,z)=x\sin y+y\cos z+C$
9. 0

10. $\dfrac{16}{3}$

11. $\dfrac{174}{35}$

12. 0

13. Use the fact that $\nabla(fg)=g\nabla f+f\nabla g$, the fact that div $(\mathbf{F}+\mathbf{G})=$ div $\mathbf{F}+$ div $\mathbf{G}$ and then write out everything component wise.