17.1

1. $P=xy \quad Q=y$

$\frac{dQ}{dx}=0 \quad \frac{dP}{dy}=x$

$D=\{x,y \mid -\sqrt{1-y^2} \le x \le \sqrt{1-y^2} \quad -1 \le y \le 1\}$

$\int_{-1}^{1}\int_{-\sqrt{1-y^2}}^{\sqrt{1-y^2}} (0-x)\,dx\,dy$

$=0$

3. $P=y^2 \quad Q=x^2$

$\frac{dQ}{dx}=2x \quad \frac{dP}{dy}=2y$

$0 \le x \le 1 \quad 0 \le y \le 1$

$\int_0^1\int_0^1 2x-2y\,dx\,dy$

$=0$

5. $P=x^2y \quad Q=0$

$\frac{dP}{dy}=x^2 \quad \frac{dQ}{dx}=0$

$\iint_D -x^2\,dA$

$x=r\cos\theta \quad y=r\sin\theta$

$\int_0^{2\pi}\int_0^1 (-r^2\cos^2\theta)\,r\,dr\,d\theta$

$=-\frac{\pi}{4}$

7. $P=x^2 \quad Q=x^2$

$\frac{dP}{dx}\frac{dQ}{dx}=2x \quad \frac{dP}{dy}=0$

$\iint_D 2x\,dy\,dx$

$\int_0^1\int_{x^2}^{x} 2x\,dy\,dx$

$=\frac{1}{6}$

9. $P=e^{x+y} \quad Q=e^{x-y}$

$\frac{dP}{dy}=e^{x+y} \quad \frac{dQ}{dx}=e^{x-y}$

$\iint_C e^{x-y}-e^{x+y}\,dx\,dy$

$0 \le y \le 2$

I don't know how to calculate this problem

13. $P=\sin xy \quad Q=3x+y$

$\frac{dP}{dy}=1 \quad \frac{dQ}{dx}=3$

$\iint_R 3-1\,dA=\iint_R 2\,dA$

$2\times\frac{1}{2}\times 3\times 2\times\frac{1}{2}=3$

$x=0 \quad 0 \le y \le 6$

$\int_0^6 y\,dy=\frac{y^2}{2}\Big|_0^6=18$

$18-6$

17.2

1.

curl $\vec{F}$

$$\begin{vmatrix} i & j & k \\ \frac{\partial}{\partial x} & \frac{\partial}{\partial y} & \frac{\partial}{\partial z} \\ xy & x & y+z \end{vmatrix}$$

$= \langle 1, 0, 1-x \rangle$

$z = 1-x^2-y^2$

$g = 1-x^2-y^2$

$P=1$ ~~$Q=0$~~ $R = 1-x$

$\iint_D \langle -1, -(1-x), 0 \rangle + \langle 1, 0, 1-x \rangle \, dA$

$\iint_D dA$

$x^2+y^2 \le 1$

$dA = r\,dr\,d\theta$

~~$\int_0^{1} \int_0^{r}$~~

$\int_0^{2\pi} \int_0^1 r\,dr\,d\theta$

$= \pi$

5. $$\begin{vmatrix} i & j & k \\ \frac{\partial}{\partial x} & \frac{\partial}{\partial y} & \frac{\partial}{\partial z} \\ e^{z^2}-y & e^z+x & \cos xz \end{vmatrix}$$

$\langle -ze^{z^2}, -z\sin xz - 2ze^{z^2}, 2 \rangle$

$x = \cos t \quad y = \sin t \quad z = 0$

$r(t) = \cos t\, i + \sin t\, j + 0\, k$

$0 \le t \le 2\pi$

$F(x,y,z) = \langle -\sin t, \cos t, 0 \rangle$

$dr/dt = (-\sin t\, i + \cos t\, j + 0\, k)\, dt$

$F \cdot dr = \langle -\sin t, \cos t, 0 \rangle \cdot \langle -\sin t, \cos t, 0 \rangle \, dt$

3. $$\begin{vmatrix} i & j & k \\ \frac{\partial}{\partial x} & \frac{\partial}{\partial y} & \frac{\partial}{\partial z} \\ e^{y-z} & 0 & 0 \end{vmatrix}$$

$\langle 0, e^{y-z}, -e^{y-z} \rangle$

$z = 1$

$P = 0 \quad Q = e^{y-z} \quad R = -e^{y-z}$

$\iint_D \langle 0, -e^{y-z}, 0 \rangle \cdot \langle 0, -e^{y-z}, 1 \rangle \, dA$

$\iint_D -e^{y-z} \, dA \quad z = 1$

$\iint_D -e^{y-1} \, dA$

$1 \le x \le 0 \quad 0 \le y \le 1$

$\int_0^1 \int_0^1 -e^{y-1} \, dy\, dx$

$= -0.632$

9. $$\begin{vmatrix} i & j & k \\ \frac{\partial}{\partial x} & \frac{\partial}{\partial y} & \frac{\partial}{\partial z} \\ yz & xz & xy \end{vmatrix}$$

$\langle 0, 0, 0 \rangle$

$\iint_D 0 \, dS$

$\iint_S \text{curl} \cdot F \, dS$

$= 0.$

$\int_0^{2\pi} -3\sin t - \cos t \sin t \, dt$

$= 0$

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11. $\begin{matrix} i & j & k \\ \frac{d}{dx} & \frac{d}{dy} & \frac{d}{dz} \\ 3y & -x & 3y \end{matrix}$

$\langle 3, 0, -5 \rangle$

~~$P=3y \quad Q=-x \quad R=3y$~~.

~~$z=z^2$~~

~~$\int\int \frac{3y}{2}(0-0-3y)\,dz$~~

~~$\int_0^{} 3y\,dz$~~.

$P=3 \quad Q=0 \quad R=-5$.

$\int\int_D (0-0-5)\,dA$

$\int\int_D -5\,dA$.

$-5 \times \pi \times 9$

$=-45\pi$

12. $\begin{matrix} i & j & k \\ \frac{d}{dx} & \frac{d}{dy} & \frac{d}{dz} \\ y & z & x \end{matrix}$

$\langle -1, -1, -1 \rangle$

$z=y$

$y=y$

$P=-1 \quad Q=-1 \quad R=-1$

$\int\int_D (-1-0-(-1)-1)\,dA$

$\int\int_D (0+1-1)\,dA$

$\int\int_D (0)\,dA$

$\iint_S \text{curl}\,F\,dS = 0$.