HW 17.1-17.2 due 12/6/20

$\boxed{17.1}$

1. $\oint xy\,dx + y\,dy \to \int_0^{2\pi} \cos\theta\sin\theta(-\sin\theta) + \sin\theta\cos\theta\,d\theta \to 0$

$\int_{-1}^{1}\int_{-\sqrt{1-x^2}}^{\sqrt{1-x^2}} (0-x)\,dy\,dx = \iint_D \left(\frac{\partial}{\partial x} y - \frac{\partial}{\partial y} xy\right) dA$

3. $\oint y^2\,dx + x^2\,dy \quad P = y^2 \quad Q = x^2 \quad \frac{\partial}{\partial y} y^2 = 2y \quad \frac{\partial}{\partial x} x^2 = 2x$

$\iint 2x - 2y\,dA \to \int_0^1\int_0^1 2x - 2y\,dx\,dy \to \boxed{0}$

HW 17.1 - 17.2 | due 12/6/20

5. $\oint x^2 y\,dx$ $\quad P = x^2y \quad \frac{\partial}{\partial y} x^2y = x^2$

$\int_0^{2\pi}\int_0^1 r^3\cos^2\theta\,dr\,d\theta \to \int_0^{2\pi} \frac{r^4}{4}\cos^2\theta \Big|_0^1$

$\int_0^{2\pi} \frac{1}{4}\cos^2\theta\,d\theta \to \boxed{-\pi/4}$

7. $\oint F\cdot dr$, where $F\langle x^2, x^2\rangle$ $\quad C = y = x^2 \quad y = x \quad 0 \le x \le 1$

$\int_0^1\int_{x^2}^{x} 2x\,dy\,dx \to \int_0^1 2xy \Big|_{x^2}^{x} dx = \int_0^1 2x^2 - 2x^3\,dx$

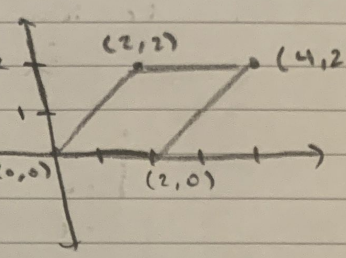
$\frac{2x^3}{3} - \frac{x^4}{2}\Big|_0^1 = \boxed{\frac{1}{6}}$

9. $F(x,y) = \langle e^{x+y}, e^{x-y}\rangle$ $\quad y \le x \le y+2$

$\iint (e^{x-y} - e^{x+y})\,dA \quad 0 \le y \le 2$

$\int_0^2 (e^{-y}(e^{2+y} - e^{y}) - e^{y}(e^{2+y} - e^{y})\,dy$

$= (2e^2 + \frac{e^4 + e^2 - e^6 - 1}{2} - 2) - 1 \to$



$\boxed{2 - \frac{e^4 + e^2 - e^6 - 1}{2} - 2e^2}$

13. $\int_C (\sin x + y)\,dx + (3x + y)\,dy$ $\quad P = \sin(x+y) \quad Q = 3x + y$

$\frac{\partial}{\partial x}(3x+y) - \frac{\partial}{\partial y}(\sin x + y) = 3 - 1 = 2$

$\iint 2\,dA$ $\quad$ * Don't know where to go from here

$\int_0^6 ?\,dy$

$\boxed{17.2}$

1. $F = \langle 2xy, x, y+z\rangle \quad z = 1 - x^2 - y^2$ for $x^2 + y^2 \le 1$

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

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

$\iint \text{curl}F\cdot dS = \int F\cdot dr = \int_0^{2\pi} F(r(t))\cdot r'(t)\,dt = \boxed{\pi}$

. $F = \langle e^{y-z}, 0, 0\rangle$ square $(1,0,1), (1,1,1)$ $(0,1,1)$ $(0,0,1)$

$\text{curl}F = \begin{vmatrix} i & j & k \\ \frac{\partial}{\partial x} & \frac{\partial}{\partial y} & \frac{\partial}{\partial z} \\ e^{y-z} & 0 & 0 \end{vmatrix}$ $\quad e^{y-z} + e^{y-z} \quad 2e^{y-z}$

$\iint 2e^{y-z}\,\frac{\nabla f}{\|\nabla f\|}\,\|\nabla f\|\,dA = \boxed{e^{-1} - 1}$

HW 17.1 - 17.2 due 12/6/20

5. $F = \langle e^{z^2} - y, e^{z^3} + x, \cos(xz) \rangle$ $x^2+y^2+z^2=1$, $z \geq 0$

$$\text{curl}F = \begin{vmatrix} i & j & k \\ \frac{\partial}{\partial x} & \frac{\partial}{\partial y} & \frac{\partial}{\partial z} \\ e^{z^2}-y & e^{z^3}+x & \cos xz \end{vmatrix} = \langle -3z^2 e^{z^3}, 2ze^{z^2} + z\sin(xz), 2 \rangle$$

$$\int \langle -3z^2 e^{z^3}, 2ze^{z^2} + 2\sin xz, 2 \rangle \nabla f \, dA = \boxed{2\pi}$$

9. $F = \langle yz, xz, xy \rangle$ $x^2+y^2=1$ $z=1, 4$

$$\int \text{curl } F \cdot \nabla f \, dA$$

$$\text{Curl } F = \begin{vmatrix} i & j & k \\ \frac{\partial}{\partial x} & \frac{\partial}{\partial y} & \frac{\partial}{\partial z} \\ yz & xz & xy \end{vmatrix} \rightarrow \boxed{0}$$

11. $F = \langle 3y, -2x, 3y \rangle$ $x^2+y^2=9$, $z=2$

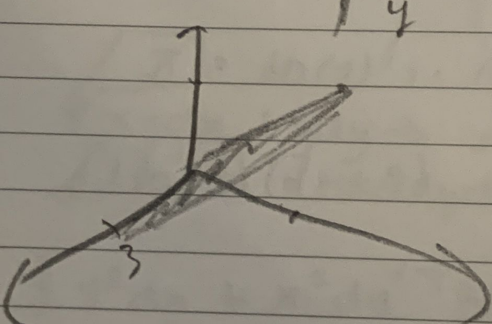
$$\text{curl}F \begin{vmatrix} i & j & k \\ \frac{\partial}{\partial x} & \frac{\partial}{\partial y} & \frac{\partial}{\partial z} \\ 3y & -2x & 3y \end{vmatrix} = \langle 3, 0, -5 \rangle$$

$$\int \text{curl } F \cdot \nabla f \, dA$$

$$\int \langle 3, 0, -5 \rangle \nabla f \, dA = \boxed{\cancel{+}45\pi}$$

13. $F = \langle y, z, x \rangle$ $(0,0,0)$, $(3,0,0)$, $(0,3,3)$

$$\text{curl}F = \begin{vmatrix} i & j & k \\ \frac{\partial}{\partial x} & \frac{\partial}{\partial y} & \frac{\partial}{\partial z} \\ y & z & x \end{vmatrix} = \langle -1, -1, -1 \rangle$$



$$\int \text{curl}F \cdot \nabla f \, dA$$

$$\int \langle -1, -1, -1 \rangle \nabla f \, dA = \boxed{0}$$