17.2

1) $F = \langle 2xy, x, y+z \rangle$

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

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

$g(x,y) = 1 - x^2 - y^2$

$g_x = -2x$

$g_y = -2y$

$z = 0$

$\text{curl } F = \langle 1, 0, 1-2x \rangle$

$$\iint_R (P g_x + Q g_y - R)\, dA$$

$$\int\int (+2x + 2x - 1)\, dA$$

$$\int\int (+4x - 1)\, dA$$

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

$$r^2 \le 1$$

$$r = 1$$

$$\int_0^{2\pi}\int_0^1 (+4r\cos\theta - 1)r \, dr \, d\theta$$

$$= -\pi - \frac{4\sin(2\pi)}{3}$$

$$= +\pi$$

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

$F = \langle 1 - y, 1 + x, 1 \rangle$

Curl $F \langle 0, 0, 2 \rangle$

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

$$= 2\pi$$

7) $F = \langle 3z, 5x, -2y \rangle$

$x^2 + y^2 = 4$

$r = 2$

$z = 4 - x^2 - y^2$ $\theta = 0 .. 2\pi$

Curl $F = \langle -2, 0, 5 + 6y \rangle$

$$g(x,y) = 4 - x^2 - y^2$$
$$g_x = -2x$$

$$\iint -4x + 5 + 6y$$

$$\int_0^{2\pi} \int_0^2 \left(4(r\cos\theta) + 5 + 6(r\sin\theta)\right) r \, dr\, d\theta$$

$$\int_0^{2\pi} \int_0^2 \left(-4r^2\cos\theta + 5r + 6r^2\sin\theta\right) dr\, d\theta$$

$$= 20\pi$$

9) $F = \langle yz, xz, xy \rangle$

$x^2 + y^2 = 1$

$z = 1$ and $z = 4$

Curl $= 0$

11) $F = \langle 3y, -2x, 3y \rangle$

$x^2 + y^2 = 9$ $\quad z = 2$

Curl $F = \langle 3, 0, -5 \rangle$

$r = 0 \ldots 3$

$\theta = 0 \ldots 2\pi$

$g(x, y) = 9 - x^2 - y^2$

$g_x = -2x$

$$\int_0^{2\pi}\int_0^{3} (6r\cos\theta - 5)\, dr\, d\theta$$

$$= -45\pi$$

13) $F = \langle y, z, x \rangle$, C is triangle with $(0,0,0), (3,0,0), (0,3,3)$

$$\begin{vmatrix} x & y & z \\ 3 & 0 & 0 \\ 0 & 3 & 3 \end{vmatrix}$$

$$0 - y(9) + z(9)$$

$$-9y + 9z = 0$$

$$z - y = 0$$

$$g(x, y) = y$$

$$g_x = 0$$

$$g_y = 1$$

$$\text{Curl } F = \langle 0, -1, -1 \rangle$$

$$\int D \int +1 - 1$$

$$= 0$$

17.1

1, 3, 5, 7, 9, 13

1) $\oint_C \overset{P}{xy}\,dx + \overset{Q}{y}\,dy$

$$\iint_R (0 - x)\,dA$$

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

$$= 0$$

$x^2 + y^2 = 1$

$r = 1$

$\theta = 0..2\pi$

$x = r\cos\theta$

3) $\oint_C \overset{P}{y^2}\,dx + \overset{Q}{x^2}\,dy$

$0 \le x \le 1$,

$0 \le y \le 1$

$$\iint_R (2x - 2y)\,dA$$

$$2\int_0^1\int_0^1 (x - y)\,dx\,dy = 0$$

5) $\oint \underset{P}{x^2 y}\,dx + \underset{Q}{0}\,dy$

$x^2+y^2=1$

$r=0..1$

$\theta=0..2\pi$

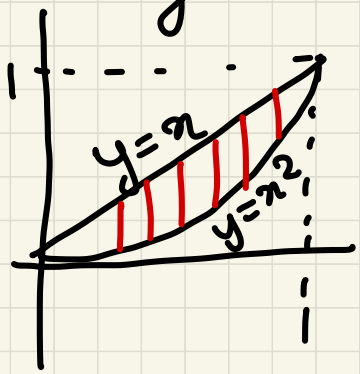
$$\iint_R (0 - x^2)\,dA$$

$$-\int_0^{2\pi}\int_0^1 r^2\cos^2\theta \cdot r\,dr\,d\theta = -\frac{\pi}{4}$$

7) $\oint \underset{P}{x^2}\,dx + \underset{Q}{x^2}\,dy$

$y=x^2$

$y=x$



$$\iint_R 2x\,dA$$

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

$$= +\frac{1}{6}$$

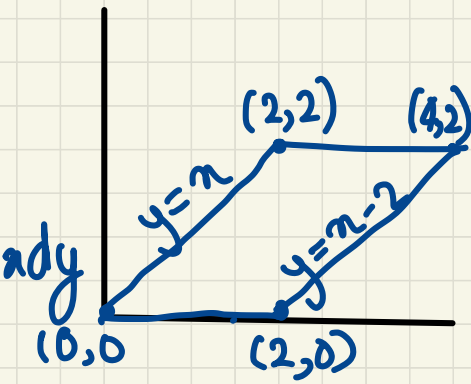
- $\dfrac{(e^2-1)(e^4-5)}{2}$

9) $\oint e^{x+y}\,dx + e^{x-y}\,dy$

P Q

$\iint_R e^{x-y} - e^{x+y}$

$\int_0^2 \int_{y+2}^{y} e^{x-y} - e^{x+y}\,dx\,dy$



$= \frac{-e^4 - 5e^2 + e^6 + 5}{2}$ ✓

13) $\int$ of closed path $-$ $\int$ of line path

P Q

$\int_C (\sin x + y)\,dx + (3x + y)\,dy$

$\iint_R (3 - 1)\,dA$

$A = \frac{1}{2}(b_1 + b_2)h$

$= \frac{8(2)}{2}$

$= 8$

16

$\int$ of line path $x \xi \, dx = 0$

$$\int_0^6 y \, dy$$

$$\left[\frac{y^2}{2}\right]_0^6$$

$$\frac{6^2}{2}$$

$$= 18$$

★?