17.1

1

$$\oint_C \langle xy, y\rangle d\vec{r}$$
$$= \int_0^{2\pi} \langle \cos t \sin t, \sin t\rangle \cdot \langle -\sin t, \cos t\rangle dt$$
$$= \int_0^{2\pi} -\cos t \sin^2 t + \sin t \cos t \; dt$$
$$= \Big|_0^{2\pi} -\frac{\sin^3 t}{3} + \frac{\sin^2 t}{2} \; dt$$
$$= 0$$

$$= \iint_D 0 - x \; dA$$

SInce A is symmetric over x and F is even, the integral is 0

$$= 0$$

3

$$\oint_C \langle y^2, x^2\rangle$$
$$\iint_D 2x - 2y \; dA$$
$$\Big|\Big|_D yx^2 - xy^2 \; dA$$
$$= 1 - 1$$
$$= 0$$

5

$$\oint_C \langle 5y, 2x\rangle$$
$$= \iint_D 2 - 5 \; dA$$
$$= \iint_D -3 \; dA$$
$$= 2 * 1 * 0.5 * -3$$
$$= -3$$

7

$$\oint_C \langle x^2 y, 0\rangle$$
$$= \iint_D -x^2 \, dA$$
$$= \int_0^{2\pi} \int_0^1 -r^3 \cos^2\theta \, dr d\theta$$
$$= \int_0^{2\pi} -\tfrac{1}{4}\cos^2\theta \, d\theta$$
$$= \int_0^{2\pi} -\tfrac{1}{4}(\tfrac{1}{2} + \tfrac{\cos(2\theta)}{2}) \, d\theta$$
$$= \Big|_0^{2\pi} - \tfrac{1}{4}(\tfrac{1}{2}\theta + \tfrac{\sin(2\theta)}{2}) \, d\theta$$
$$= \tfrac{\pi}{4}$$

11

$$\oint_C \langle x^{x+y}, e^{x-y}\rangle$$
$$= -\iint_D e^{x-y} - e^{x+y} \, dA$$
$$= -\int_0^2 \int_y^{y+2} e^{x-y} - e^{x+y} \, dx dy$$
$$= \int_0^2 e^{2y+2} - e^{2y} + 1 - e^2 \, dy$$
$$= \tfrac{1}{2}e^6 - \tfrac{1}{2}e^2 - \tfrac{1}{2}e^4 + \tfrac{1}{2} + 2 - 2e^2$$
$$= \tfrac{1}{2}e^6 - \tfrac{5}{2}e^2 - \tfrac{1}{2}e^4 + \tfrac{5}{2}$$
$$= \tfrac{1}{2}(e^4 - 5)(e^2 - 1)$$

13

a

$$\nabla f = \langle 2xe^y, x^2 e^y\rangle$$
$$f = x^2 e^y$$

b

$$\vec{r} = \langle t, 0\rangle$$
$$\oint_{OA} \langle 0, t\rangle \cdot \langle 1, 0\rangle dt$$
$$= 0$$

$\vec{r} = \langle 0, t \rangle$

$\oint\limits_{OB} \langle 0, 0 \rangle \cdot \langle 0, 1 \rangle dt$

$= 0$

C

$\oint\limits_{C} \vec{F} \cdot d\vec{r}$

$= \oint\limits_{C} (\nabla f + \vec{G}) \cdot d\vec{r}$

$= f(B) - f(A) + \oint\limits_{C} \vec{G} \cdot d\vec{r}$

$= f(B) - f(A) + \iint\limits_{D} 1 \; dA - \oint\limits_{BO} \langle 0, 0 \rangle \cdot \langle 0, 1 \rangle dt - \oint\limits_{OA} \langle 0, t \rangle \cdot \langle 1, 0 \rangle dt$

$= f(B) - f(A) + \frac{16\pi}{4}$

$= f(B) - f(A) + 4\pi$

$= 4\pi - 16$