Solution (18.1)**:**

(a) The function $f(z) = z^n$ is analytic on $\mathbb{C} \cup \{\infty\}$.

(b) The functions $f(z) = \sin(z)$ is analytic on $\mathbb{C}$, $f(z) = \cos(z)$ is analytic on $\mathbb{C} \cup \{\infty\}$, while $f(z) = \tan(z)$ is analytic everywhere except for singularities at $n\pi/2$.

(c) The function $f(z) = |z|$ is analytic nowhere.

(d) The function $f(z) = \frac{z-i}{z+1}$ is analytic everywhere except for $z = -1$.

(e) The function $f(z) = \frac{z^2+1}{z}$ is analytic everywhere except for $z = 0$.

(f) The function $f(z) = \frac{p_n(z)}{q_m(z)}$ is analytic everywhere except for the roots of q.

(g) The function $x^2 + y^2$ is analytic nowhere.

(h) The function e^z is analytic on $\mathbb{C}$.

(i) The function e^{-iy} is analytic nowhere.

(j) The function $\ln(z)$ is analytic everywhere except for $(-\infty, 0]$.

Solution (18.2)**:** Let $w(z) = u(x,y) + iv(x,y)$. Then,

$$\begin{aligned} i\frac{\partial}{\partial x}(w(x+iy)) - \frac{\partial}{\partial y}(w(x+iy)) &= i\frac{\partial}{\partial x}(u(x,y) + iv(x,y)) - \frac{\partial}{\partial y}(u(x,y) + iv(x,y)) \\ &= i\left(\frac{\partial u}{\partial x} - \frac{\partial v}{\partial y}\right) - \left(\frac{\partial u}{\partial y} + \frac{\partial v}{\partial x}\right). \end{aligned}$$

Solution (18.4)**:**

Solution (18.5)**:**

Solution (18.6)**:**

Solution (18.7)**:**

Solution (18.11)**:**

Solution (18.14)**:**

Solution (18.15)**:**

Solution (18.18)**:**