Solution (20.1)**:** We know that $\sin(z)$ is conformal when $\frac{d}{dz}(\sin(z)) \neq 0$, meaning that we verify when $\cos(z) \neq 0$. This occurs at $z = n\pi$, where $n \in \mathbb{Z}$.

We know that $\sin(z) = 0$ when $z = \pi$, with $\cos(z) = -1 = e^{i\pi}$. Therefore, the image of $z = \pi$ is not stretched, and is rotated by an angle of π.

We know that the image of $z = i\pi$ is stretched by a factor of $|\cos(i\pi)| = |\cosh(\pi)|$. Since $\cosh(\pi) = |\cosh(\pi)|$, the image is rotated by an angle of 0.

Evaluating $\cos(\pi/2 + i\pi)$, we get that it is equal to $-\sin(\pi/2)\sin(i)$, or $-i\sinh(1) = \sinh(1)e^{-i\pi/2}$. Therefore, the image of $z = \pi/2 + i$ is stretched by a factor of $\sinh(1)$ and rotated by an angle of $-\pi/2$.

Solution (20.9)**:** Mapping $|z - 1| < 1$ to the plane $\operatorname{Re}(w) > 0$, with $w(0) = \infty$, we have

$$w(z) = \frac{az + b}{cz}.$$

Now, we want $z = 2$ to map to zero, giving

$$w(z) = \frac{a(z - 2)}{cz}.$$

Finally, an entirely arbitrary decision made by the problem solver has it such that $z = 1$ maps to $z = 1$. Thus, we have

$$\frac{-a}{c} = 1.$$

Therefore, we get the Möbius transformation of

$$w(z) = \frac{2 - z}{z}.$$

Problem Solver's Note: It is not possible for $|z - 1| < 0$, as norms are always at least equal to zero. The problem solver has decided to interpret the question such that it becomes nontrivial.

Solution (20.10)**:** The first map of e^z has it such that $\operatorname{Re}(w)$ ranges from $e^{\operatorname{Re}(z_1)}$ to $e^{\operatorname{Re}(z_2)}$, while $\arg(w)$ ranges from 0 to π, which agrees with the map showing an annular strip in the w-plane.

The second map of e^z maps z_1, z_2, and z_3 to $e^{\operatorname{Re}(z_1)}$, 1, and $e^{\operatorname{Re}(z_3)}$, eventually converging to 0 as z_3 becomes more and more negative. Similarly, e^z maps z_4, z_5, and z_6 to $e^{i\pi\operatorname{Re}(z_4)}$, -1, and $e^{i\pi\operatorname{Re}(z_6)}$, similarly converging to 0 as z_4 becomes more and more negative.

Solution (20.11)**:**

Solution (20.12)**:**

Solution (20.14)**:**

Solution (20.15)**:**

Solution (20.16)**:**

Solution (20.17)**:**