Problem 1. [§3.33.4(a)] Show that the result of Exercise 3 could have been obtained by writing
\[ (-1 + \sqrt{3})^2 = [(-1 + \sqrt{3})^{\frac{1}{2}}]^3 \]
and first finding the square roots of \(-1 + \sqrt{3}\).

**Solution.** Notice that \(z_0 = -1 + \sqrt{3} = 2e^{\frac{j\pi}{2}}\). Thus \((z_0)^\frac{1}{2} = \sqrt{2}e^{\frac{j\pi}{4} + \frac{j\pi n}{2}}\) for \(n \in \mathbb{Z}\). Then,
\[ z_0^2 = 2^2 e^{j\frac{3\pi}{2} + j3\pi n} = 2\sqrt{2}e^{j\pi x + 3\pi n} = \pm 2\sqrt{2}, \]
where the sign depends on the parity of the chosen \(n\).

Problem 2. [§3.33.9] Assuming \(f'(z)\) exists, state the formula for the derivative of \(e^{f(z)}\).

**Solution.** Recall that \(e^{f(z)} = e^{f(z)} \log c\). Thus
\[
\frac{d}{dz} e^{f(z)} = \left[ \frac{d}{dz} f(z) \log c \right] e^{f(z)} \log c
= \left[ \frac{d}{dz} f(z) \log c \right] f'(z)
= f'(z) (\log c) e^{f(z)}.
\]

Problem 3. [§3.34.8] Point out how it follows from expressions (15) and (16) in §34 for \(|\sin z|^2\) and \(|\cos z|^2\) that

a. \(|\sin z| \geq |\sin x|\);

b. \(|\cos z| \geq |\cos x|\).

**Solution.** We are given that \(|\sin z|^2 = \sin^2 x + \sinh^2 y\). Thus
\[
|\sin z|^2 \geq \sin^2 x + \sinh^2 y
= |\sin^2 x + \sinh^2 y| \text{ since the above number is non-negative;}
\geq |\sin^2 x| + |\sinh^2 y|
\geq |\sin x|
= |\sin x|^2.
\]
Thus \(|\sin z| \geq |\sin x|\). The other result follows similarly.