

**Reading:** Sections 3.1-4.

1. Write each of the following numbers in the form  $a + bi$ .
 

a) $\sin(2i)$	b) $\cos(1 - i)$	c) $\sinh(1 + \pi i)$	d) $\cosh(\pi i/2)$
e) $\text{Log}(\sqrt{3} + i)$	f) $\log(1 - i)$	g) $2^{\pi i}$	$\sin^{-1}(-i)$ .
2. Solve the following equations.
 

a) $\text{Log}(z^2 - 1) = i\pi/2$	b) $\sin z = 2$
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3. Find the principal value (i.e., the value given by the principal branch) of each of the following.
 

a) $i^{2i}$	b) $(1 + i)^{1+i}$
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4. Give an example to show that the principal value of  $(z_1 z_2)^\alpha$  need not be equal to the product of principal values  $z_1^\alpha z_2^\alpha$ .
5. Determine the domain of analyticity for the function  $f(z) = \text{Log}(4 + i - z)$  and compute  $f'(z)$ .
6. Find a branch of  $\log(2z - 1)$  that is analytic at all points in the complex plane except those on the following rays
  - a)  $\{x + iy \mid x \leq 1/2, y = 0\}$
  - b)  $\{x + iy \mid x \geq 1/2, y = 0\}$
  - c)  $\{x + iy \mid x = 1/2, y \geq 0\}$
7. Find the derivative for each of the following
  - a)  $\exp[\sin(2z)]$
  - b)  $\tan^3 z$
  - c) the principal branch of  $z^{1+i}$  at  $z = i$
8. Find a branch of each of the following multiple-valued functions that is analytic in the given domain:
  - a)  $(z^2 - 1)^{1/2}$  in the unit disk,  $|z| < 1$ .
  - b)  $(4 + z^2)^{1/2}$  in the complex plane slit along the imaginary axis from  $-2i$  to  $2i$ .
  - c)  $(z^4 - 1)^{1/2}$  in the exterior of the unit circle,  $|z| > 1$ .
  - d)  $(z^3 - 1)^{1/3}$  in the exterior of the unit circle,  $|z| > 1$ .