# Elementary Functions- HW Problems

1. Use the power series around $0$ for $e^z$ given by $e^z = \sum_{n=0}^{\infty} \frac{z^n}{n!}$ to find a power series for the following functions.

a. $f(z) = \sin(z)$

b. $g(z) = \cosh(z)$

2. Find a power series expression around $0$ for the following functions.

a. $f(z) = \frac{\cos(z) - 1 + \frac{z^2}{2}}{z^3}$

b. $g(z) = \frac{\sinh(z) - z}{z^2}$

c. $h(z) = \frac{e^{(z^2)} - 1 - z^2}{z^4}$

3. Write the following expressions in $a + bi$ form.

a. $\sin(2i)$

b. $\cos(4i)$

c. $\sinh\left(\frac{\pi i}{2}\right)$

d. $\cosh\left(\frac{3\pi i}{2}\right)$

4. Using the fact that $e^z = e^x\big(\cos(y) + isin(y)\big)$; where $z = x + iy$, write the following functions as $f(x, y) = u(x, y) + iv(x, y)$.

a. $\cos(z)$

b. $\sin(z)$

c. $\cosh(z)$

d. $\sinh(z)$