Quiz 8

1. (5 points). Compute the derivative of $H(z) = \ln \sqrt{\frac{a^2-z^2}{a^2+z^2}}$.

2. (5 points). Compute the derivative of $f(x) = (x^2 - 1)^{\sin x}$.

3. (5 points). Boyle's Law for an ideal gas at constant temperature with pressure P and volume V is $PV = C$, where C is some positive constant. Our gas has $C = 104$ kPa $\cdot$ m^3. Suppose at $t = 10$ s, $V = 2$ m^3, $P = 52$ kPa, and $\frac{dV}{dt} = -\frac{1}{2}$ m^3/s. What is $\frac{dP}{dt}$ at this time?

Extra credit. (2 points). Suppose $y(x)$ is a function satisfying $xy'' + y' + xy = 0$ for all values x, and $y(0) = 1$. Find $y'(0)$ and $y''(0)$. (This y is called a Bessel function of order 0).