

Homework Assignment #1
(60 points)Due Tuesday, August 30
(at lecture)

1.1 (10 points) Boas Sec. 2.5, Problems 16, 28, 33, 53, 62, 64

1.2 (10 points) Boas Sec. 2.10, Problems 31, 32

1.3 (10 points) Boas Sec. 2.11, Problems 17, 18

1.4 (10 points) Show that

$$\tanh^{-1}z = \frac{1}{2} \ln \left(\frac{1+z}{1-z} \right),$$
$$\coth^{-1}z = \frac{1}{2} \ln \left(\frac{z+1}{z-1} \right).$$

Are these expressions unique? If not, give all the possible values of $\tanh^{-1}z$ and $\coth^{-1}z$.

1.5 (10 points)

(a) Find the finite sum

$$S_N = \sum_{n=0}^{N-1} R^n \cos n\theta,$$

where R and θ are real numbers.(b) Find the value of S_N when $R = 1$ and $\theta = 2\pi m/N$, where m is an integer that takes on the values $m = 0, 1, \dots, N-1$. Explain your answer.(c) Assuming $|R| < 1$, find $\lim_{N \rightarrow \infty} S_N$.

1.6 (10 points) Challenge problem