

**Power Series Coefficients**

Consider the power series:

$$f(z) = \sum_{n=0}^{\infty} c_n (z - z_0)^n$$

expanded around the point  $z_0$ . The coefficients are found from the formula:

$$c_n = \frac{f^{(n)}(z_0)}{n!}$$

1. Find the first four non-zero coefficients for  $\sin \theta$  expanded around the origin.
2. Write out the series approximation, correct to 4th order, for  $\sin \theta$  expanded around the origin.  
  
 $\sin \theta =$
3. Find the first four non-zero coefficients for  $\sin \theta$  expanded around  $\theta_0 = \pi/6$ .
4. Write out the series approximation, correct to 4th order, for  $\sin \theta$  expanded around  $\theta_0 = \pi/6$ .  
  
 $\sin \theta =$
5. What does it mean to write a series expansion around the point  $a$ ?
6. Briefly describe in words how to expand the series approximation for a function, correct to 4th order.