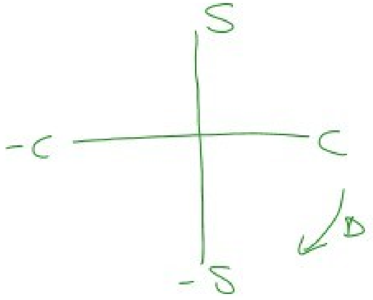
Calc BC 9.10 Notes Name: Block: Seat:



Find the radius (and interval) of convergence for

Review

1. Use the function $f(x) = \cos x$ to form the Maclaurin series
$$\sum_{n=0}^{\infty} \frac{f^{(n)}(0)}{n!} x^n$$

(a) Find the derivatives

$f'(x) = -\sin x$

$f''(x) = -\cos x$

$f'''(x) = \sin x$

$f^{(4)}(x) = \cos x$

(b) evaluate the derivatives at zero

$f'(0) = 0$

$f''(0) = -1$

$f'''(0) = 0$

$f^{(4)}(0) = 1$

(c) Assemble the series

$$\cos x = f(0) + \frac{f'(0)x^1}{1!} + \frac{f''(0)x^2}{2!} + \frac{f'''(0)x^3}{3!} + \frac{f^{(4)}(0)x^4}{4!} + \cdots$$

$$\cos x = 1 + \frac{0x}{1} + \frac{(-1)x^2}{2!} + 0 + \frac{(1)x^4}{4!} + \cdots + \frac{x^{2n}}{(2n)!} + \cdots$$

(d) Use the ratio test to conclude that the series converges for all x

$$\lim_{n\to\infty}\left|\frac{x^{2n+1}}{(2n+1)(2n)!}\cdot\frac{(2n)!}{x^{2n}}\right| = \lim_{n\to\infty}\left|\frac{x}{2n+1}\right| = 0 < 1$$

$(-\infty, \infty)$