

MEMORIZE THESE MACLAURIN SERIES

f(x)	Maclaurin Series	General Term
e^x		
$\sin x$		
$\cos x$		
$\ln(1+x)$		
$\frac{1}{1-x}$		
$\frac{1}{1+x}$		
$\tan^{-1} x$		

1. Write out the first four terms of the Maclaurin of $f(x)$ if
 $f(0) = 2, \quad f'(0) = 3, \quad f''(0) = 4, \quad f'''(0) = 12$

2-5: Find the Maclaurin series for $f(x)$ using the definition of a Maclaurin series. [Assume that f has a power series expansion.] Also find the associated radius of convergence.

2. $f(x) = (1-x)^{-2}$

3. $f(x) = \ln(1+x)$

4. $f(x) = \sin \pi x$

5. $f(x) = e^{3x^2}$

Review:

R1. **Calculator** What is the approximate volume of the solid obtained by revolving the region in the first quadrant enclosed by the curves $y = x^3$ and $y = \sin x$ about the x-axis?

- a. 0.061π
- b. 0.139π
- c. 0.215π
- d. 0.225π
- e. 0.278π

R3. **Calculator** What is the approximate slope of the tangent to the curve $x^3 + y^3 = xy$ at $x=1$?

- a. -2.420
- b. -1.325
- c. -1.014
- d. -0.698
- e. 0.267

R2. **Calculator** The volume of the solid generated by revolving the region bounded by the graphs of $y = \sqrt{x}$ and $y = x$ about the y-axis is

- a. $\frac{2\pi}{15}$
- b. $\frac{\pi}{6}$
- c. $\frac{2\pi}{3}$
- d. $\frac{16\pi}{15}$
- e. $\frac{56\pi}{15}$

R4. **Calculator** Given $f(x) = x^2e^x$, what is the approximate value of $f(1.1)$, if you use the tangent line to the graph of f at $x=1$?

- a. 3.534
- b. 3.635
- c. 7.055
- d. 8.155
- e. 10.244

Answers:

1. $f(x) = 2 + 3x + 2x^2 + 2x^3$

2. $M(x) = 1 + 2x + 3x^2 + 4x^3 + 5x^4 + \dots = \sum_{n=0}^{\infty} (n+1)x^n$ or $\sum_{n=1}^{\infty} nx^{n-1}$ R.O.C = 1

3. $M(x) = x - \frac{x^2}{2} + \frac{x^3}{3} - \frac{x^4}{4} + \dots = \sum_{n=0}^{\infty} \frac{(-1)^n x^{n+1}}{n+1}$ R.O.C = 1

4. $M(x) = \pi x - \frac{\pi^3 x^3}{3!} + \frac{\pi^5 x^5}{5!} - \frac{\pi^7 x^7}{7!} + \dots = \sum_{n=0}^{\infty} \frac{(-1)^n x^{2n+1}}{(2n+1)!}$ R.O.C = ∞

5. $M(x) = 1 + 3x^2 + \frac{9x^4}{2} + \frac{27x^6}{3!} + \frac{81x^8}{4!} + \dots = \sum_{n=0}^{\infty} \frac{3^n x^{2n}}{n!}$ R.O.C = ∞

R1. B R2. A R3. C R4. A