

1. The interval of convergence of the power series

$$\sum_{n=1}^{\infty} \frac{(n+1)(2x+1)^n}{2^n n^2}$$

- a) $(-\frac{3}{2}, \frac{1}{2})$
- b) $[-\frac{3}{2}, \frac{1}{2}]$
- c) $(-\frac{3}{2}, \frac{1}{2})$
- d) $[-\frac{3}{2}, \frac{1}{2})$
- e) $(1, 2]$
- f) $[1, 2]$
- g) $\{\frac{-1}{2}\}$
- h) $(-\infty, \infty)$

2. Find coefficient on x^6 in the Maclaurin series for $f(x) = \cosh(2x)$

using the identity $\cosh(x) = \frac{1}{2}(e^x + e^{-x})$

- a) 1
- b) $\frac{4}{45}$
- c) $\frac{2}{3}$
- d) 2
- e) $\frac{1}{24}$
- f) $\frac{1}{720}$
- g) $\frac{8}{35}$
- h) $\frac{2}{315}$

3. Find the third degree Taylor polynomial for $f(x) = x^{3/2}$ centered at $x = 4$.

4. Evaluate the limit

$$\lim_{x \rightarrow 0} \frac{x^2 + x \ln(1-x)}{xe^{-5x} - x + 5x^2}$$

- a) 1
- b) $\frac{1}{4}$
- c) $\frac{-1}{100}$
- d) $\frac{-1}{15}$
- e) $\frac{-1}{10}$
- f) $\frac{-1}{5}$
- g) $\frac{-1}{50}$
- h) $\frac{-1}{25}$

5. If $f(x) = x^3 \cos(x^2)$, find $f^{(11)}(0)$, the value of the eleventh derivative evaluated at 0.

- | | |
|---------------------|----------------------|
| a) 1 | e) $\frac{-10!}{5!}$ |
| b) $\frac{1}{24}$ | f) $\frac{11!}{4!}$ |
| c) $\frac{121}{16}$ | g) $\frac{11}{5}$ |
| d) $\frac{13}{6}$ | h) $\frac{11}{4}$ |

6. Estimate

$$\int_0^1 \arctan(x^2) dx$$

With an error less than 0.01.
Explain for full credit.

- | | |
|------------------------|-------------------------|
| (A) $\frac{351}{1155}$ | (E) $\frac{101}{124}$ |
| (B) $\frac{13}{42}$ | (F) $\frac{5}{8}$ |
| (C) $\frac{17}{36}$ | (G) $\frac{11}{24}$ |
| (D) $\frac{48}{31}$ | (H) $\frac{2867}{9248}$ |

7. According to Taylor's remainder estimate, what is the maximum possible error made in the use of the quadratic approximation to the Maclaurin series for $f(x) = \frac{1}{(1-x)^2}$ on the interval $\left[-\frac{1}{4}, \frac{1}{4}\right]$?

- | | |
|----------------------|---------------------|
| a) $\frac{1}{4}$ | e) $\frac{10}{9^5}$ |
| b) $\frac{4}{3}$ | f) $\frac{3}{4}$ |
| c) $\frac{4^3}{3^5}$ | g) $\frac{4}{3!}$ |
| d) $\frac{3}{4!}$ | h) $\frac{4!}{3!}$ |

ANSWERS:

1. D 2. B

3. $T_3 = 8 + 3(x-4) + \frac{3}{16}(x-4)^2 - \frac{1}{128}(x-4)^3$

4. H 5. F 6. A 7. C