1. Find the Taylor series of \( \frac{1}{1+2x^2} \) with center \( x=0 \). What is its radius of convergence?

2. Find the quadratic approximation of \( \sqrt{1+\sin x} \) around \( x=0 \).

3. Find a series (of rational numbers) whose sum converges to 
\[ \int_0^2 \sin(x^3) \, dx \]

4. Find the Taylor series of \( f(x) = \frac{1}{2} (e^x + e^{-x}) \).
Find the Fourier series \((2\pi\text{ - periodic})\) of \(f(x)\), where:

\[
f(x) = \begin{cases} 
1 & -\pi/2 \leq x < \pi/2 \\
0 & -\pi \leq x \leq -\pi/2 \text{ or } \pi/2 \leq x < \pi
\end{cases}
\]

\(f(x+2\pi) = f(x)\).

Find the real & complex Fourier coeffs. of \(\sin^2 x\).

(hint: find a way to avoid taking any integrals).

Find the steady-state \((2\pi\text{-periodic})\) solution to

\[f''(t) + 10f(t) = \cos t + \cos(3t)\]