10. [9 points]
   
   a. [3 points] Find the first three nonzero terms in the Taylor series of \( f(y) = \frac{1}{(1 + y)^{3/2}} \) about \( y = 0 \). Show all your work.

   b. [2 points] Use your answer in (a) to find the first three nonzero terms in the Taylor series of \( g(x) = \frac{1}{(a^2 + x^2)^{3/2}} \) about \( x = 0 \). Show all your work.

   c. [2 points] For which values of \( x \) is the Taylor series for \( g(x) \) about \( x = 0 \) expected to converge?

   Problem continues on the next page
Continuation of problem 10.

The force of gravitational attraction \( F \) between a rod of length \( 2L \) and a particle at a distance \( a \) is given by

\[
F = k \int_0^L \frac{1}{(a^2 + x^2)^{\frac{3}{2}}} \, dx,
\]

where \( k \) is a positive constant.

\[ \text{d.} \quad [2 \text{ points}] \quad \text{Use your answer in (b) to obtain an approximation for the force of gravitational attraction } F \text{ between the rod and the particle. Your answer should depend on the constants } k, a \text{ and } L. \text{ Show all your work.} \]