Precalculus Unit 3: 3.1 Homework
Rational Functions and Asymptotes

Match each function with its graph.

1. \( f(x) = \frac{2}{x+2} \)
2. \( f(x) = \frac{1}{x-3} \)
3. \( f(x) = \frac{4x+1}{x} \)
4. \( f(x) = \frac{1-x}{x} \)
5. \( f(x) = \frac{x-2}{x-4} \)
6. \( f(x) = \frac{-x-2}{x+4} \)

For each of the following functions, find the domain, vertical asymptotes / holes, and horizontal asymptotes. Provide supporting work.

7. \( f(x) = \frac{3}{(x-2)^3} \)
   - Domain:
   - Vertical Asymptote(s):
   - Hole(s):
   - Horizontal Asymptote:

8. \( f(x) = \frac{-5x^2-14x+3}{2x^2+7x+3} \)
   - Domain:
   - Vertical Asymptote(s):
   - Hole(s):
   - Horizontal Asymptote:
9. \( f(x) = \frac{3x^2+1}{x^2+x+9} \)

Domain:

Vertical Asymptote(s):

Hole(s):

Horizontal Asymptote:

10. The cost \( C \) (in millions of dollars) of removing \( p\% \) of the industrial and municipal pollutants discharged into a river is given by \( C = \frac{255p}{100-p}, \quad 0 \leq p < 100 \).

a.) Find the cost of removing 10% of the pollutants.

b.) Find the cost of removing 75% of the pollutants.

c.) According to this model, would it be possible to remove 100% of the pollutants? Why or why not?

11. The game commission introduces 100 deer into newly acquired state game lands. The population \( N \) of the herd is given by \( N = \frac{100+60t}{1+0.04t}, \quad t > 0 \) where \( t \) is time in years.

a.) Use a graphing utility to graph the model. Draw a sketch here.

b.) Find the populations when \( t = 5, \ t = 10, \ and \ t = 25. \)

c.) What is the limiting size of the herd as time increases? How did you determine this?