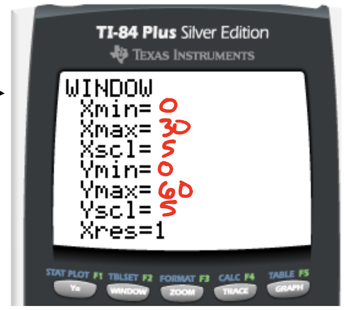
x = month
y = # of bunnies in hundreds

2.4 Application and Extension

Bunny Population

Beginning of Month	Number (in hundreds)
0	10
2	12
4	14
6	16
8	22
10	30
12	35
14	39
16	44
18	48
20	50
22	51

1. Mr. Sullivan decides to start raising bunnies. On the right is the population of these bunny rabbits over a 2-year period.
   a. Graph the scatterplot with a "friendly" window and record it here.



   b. Find a ***logistic*** regression model for the data. (Be patient, it will take the calculator a little extra time to calculate this.) Write out the logistic model below. Round all values to the nearest thousandth (three decimal places).

$$f(x) = \frac{57.712}{1+6.391e^{-0.186x}}$$

   c. Find the limit of that model as time approaches infinity. Write it below using limit notation.

$\lim_{x\to\infty} f(x) = 57.712$ hundred bunnies

   d. How does your answer from part *c* relate to the problem?

The population of rabbits will grow to about 57,712 bunnies no matter how long he raises the bunnies

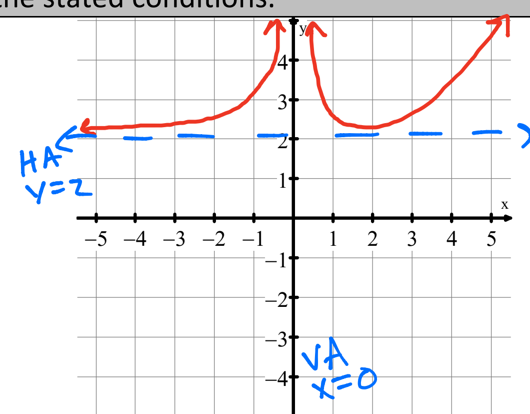
   e. Provide a reasonable explanation why a population would have a growth limit instead of growing indefinitely like an exponential model.

A population would have a growth limit because of limited resources (like food) needed to keep the population alive.

For 2 – 3, sketch a graph of a function $y = f(x)$ that satisfies the stated conditions.

2. Sketch (freehand) a graph of a function f that satisfies all of the following conditions. Include any asymptotes.

   a. $\lim_{x\to 0} f(x) = \infty$
   b. $\lim_{x\to \infty} f(x) = \infty$
   c. $\lim_{x\to -\infty} f(x) = 2$



3. Sketch (freehand) a graph of a function f that satisfies all of the following conditions. Include any asymptotes.

   a. $\lim_{x\to -\infty} f(x) = \infty$
   b. $\lim_{x\to -3^+} f(x) = \infty$
   c. $\lim_{x\to -3^-} f(x) = -\infty$
   d. $\lim_{x\to \infty} f(x) = -1$