



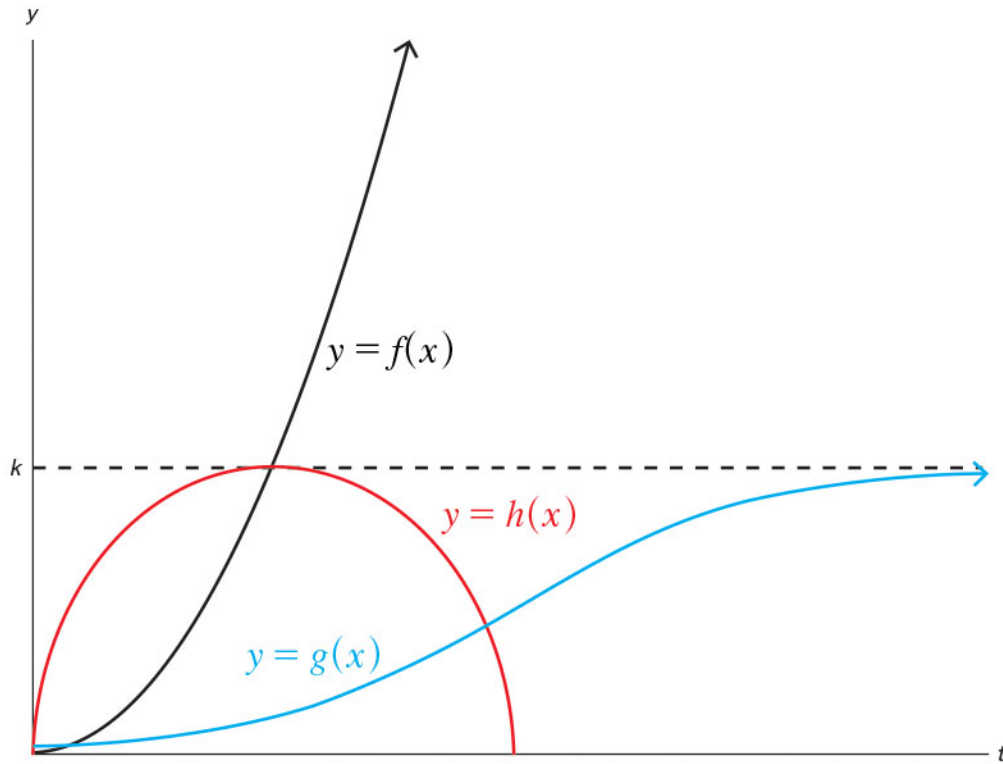
## Practice – 2

Once you feel confident with additional limits at infinity problems, complete problems 1 to 3. Check your answers by going to the Solutions tab in Moodle.

**Instructions:** Answer each of the following practice questions on a separate piece of paper. Step by step solutions are provided under the Solutions tab. You will learn the material more thoroughly if you complete the questions before checking the answers.

1. Determine  $\lim_{x \rightarrow \infty} \frac{x-1}{\sqrt{9x^2+x+1}}$  and  $\lim_{x \rightarrow -\infty} \frac{x-1}{\sqrt{9x^2+x+1}}$ .
2. Find the following limits, if they exist.
  - a.  $\lim_{x \rightarrow \infty} 5^{-x}$
  - b.  $\lim_{x \rightarrow \infty} (x^2 + x^5)$
  - c.  $\lim_{x \rightarrow \infty} \left(-\frac{2}{5}\right)^x$
  - d.  $\lim_{x \rightarrow \infty} \left(-\frac{5}{2}\right)^x$
  - e.  $\lim_{x \rightarrow \infty} \left(x^2 - \frac{3}{x} + 3\right)$

3. Astrophysicists currently believe there are three possibilities for the expansion of the universe. Depending on the amount of matter, energy, and the pull of gravity, the expansion of the universe may increase, producing an ever larger universe. It may also slow down, but never completely stop as the universe approaches a maximum size. Or, it may reach a maximum, and then collapse in on itself. Three functions are graphed below, each representing one of these possibilities. Identify which function matches each description, and using the graphs, determine the size of the universe as  $t \rightarrow \infty$ .



- the universe's expansion increases indefinitely
- the universe's expansion slows down as the universe approaches a maximum size
- the universe expands and then collapses in on itself.