2-6 EXAMPLES

1. Evaluate the following limits and justify your answers.

   (a) $\lim_{x\to-\infty} \frac{x+2}{2+x^2}$

   (b) $\lim_{x\to\infty} \frac{1-x^3}{x+4x^2}$

   (c) $\lim_{x\to\infty} \frac{3\sqrt{x}+1}{4\sqrt{x}-1}$

   (d) $\lim_{x\to-\infty} \frac{\sqrt{x+x^4}}{2+x^2}$

(e) $\lim_{x\to\infty} [\ln(x^2 + \sqrt{2}) - \ln(3x^2 - x)]$

(f) $\lim_{x\to\infty} \frac{1 - e^x}{2 + 8e^x}$

(g) $\lim_{x\to\infty} x^{-5/3} \cos x$

(h) $\lim_{x\to -\infty} \arctan(2x)$

2. Sketch the graph of an example of a function f that satisfies *all* of the given conditions:
(i) $\lim_{x\to 0} f(x) = -\infty$
(ii) $\lim_{x\to\infty} f(x) = 5$
(ii) $\lim_{x\to -\infty} f(x) = -2$

3. Let $v(t) = a(1 - e^{-gt/a})$ where a and g are fixed positive constants.

   (a) Determine $\lim_{t\to\infty} v(t)$ and explain your reasoning.

   (b) Assume that $v(t)$ is the velocity of a falling raindrop and g is acceleration due to gravity. How would you interpret your answer to part (a)?