MCS 118
Worksheet on Limits at Infinity and Infinite Limits

1. Find the following limits:

(a) \( \lim_{x \to 2} \frac{x^3 + 3}{x^2 - 1} \)

(b) \( \lim_{x \to 2} \frac{1}{(x - 2)^2} \)

(c) \( \lim_{x \to 2} \frac{x^2 - 4}{x^2 - 3x + 2} \)
2. Graph \( y = x^3 - 2x^2 + 3x \) on your calculator. Set the window coordinates so that \(-1 \leq x \leq 4\) and then set the coordinates so that \(-100 \leq x \leq 100\). Use the zoom fit feature so that the graph fits nicely in the window. Why does the graph look different in the two different windows? Of the 4 graphs below, which one most closely matches the second graph?
3. Here are five more graphs. Match each one to the appropriate graph above. Then decide how you can tell from the formula what the “end behavior” of the polynomial will be.

4. Without using your calculator, decide which graph the graph of \( y = 4x - 21x^3 + \frac{x^4}{1234} \) will most closely match.
5. Find the limits:
   (a) \( \lim_{x \to \infty} 2x^2 - x^3 - 3x \)
   (b) \( \lim_{x \to -\infty} 2x^2 - x^3 - 3x \)
   (c) \( \lim_{x \to -\infty} 3x^2 + x - 5 \)
   (d) \( \lim_{x \to \infty} (x^3 + 1)^2 \)

6. Find the limits:
   (a) \( \lim_{x \to \infty} \frac{2x^2 + 3}{4x^2 - 9} \)
   (b) \( \lim_{x \to \infty} \frac{2x^3 - 3x - 2x^4}{4x^3 + 7x + 8} \)
   (c) \( \lim_{x \to \infty} \frac{3x - 5x^3 + 7x^2}{x - 15x^4 + 5x^2} \)