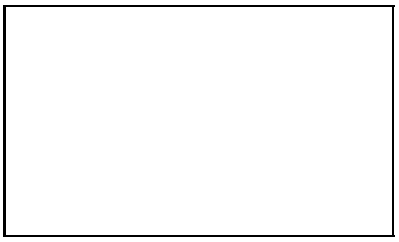
1. Consider the function $f(x) = \begin{cases} 3x^2 & \text{if } x \leq -1 \\ A + Bx^3 & \text{if } x > -1 \end{cases}$

1A) Find the conditions on A and B that make this function continuous at $x = -1$. Show all your work.

1B) Find conditions on A and B that make this function differentiable at $x = -1$. Show all your work.

1C) Let $A = 3$ and $B = 2$. Do these values satisfy the conditions in 1A? ☐ Set your calculator window to $[-2, 2] \times [-1, 8]$ and use your calculator to help draw the correct graph of f (still using $A = 3$ and $B = 2$). Draw a careful facsimile of the correct graph here (including the axes and the "tick marks": set `Xscl=1` and `Yscl=1` in the Window menu).



2. The *Intermediate Value Theorem* assumes that f is a continuous function on an interval $[a, b]$, and that d is chosen between $f(a)$ and $f(b)$. What is the conclusion of the theorem?

3. The *Extreme Value Theorem* assumes that f is a continuous function on an interval $[a, b]$, and it says that f "assumes" (or "achieves" or "attains") its maximum value on $[a, b]$. Explain what this means.

4. How is the IVT used to prove there must be a root of $x^5 - 4x^3 + 1$ somewhere between $x = 0$ and $x = 1$?