Instructions: (10 points) Solve each of the following problems without error. Show all details. Box in your answers. Use good notation, you will be marked off for bad notation. Note: The value of a limit can be a number, the symbol $+\infty$, the symbol $-\infty$, or may be labelled DNE (for “does not exist”).

(4 pts) 1. Compute $\lim_{x \to -1} \frac{4x^2 + x}{x}$

   Solution: As discussed in class, this is a “Skill Level 0” limit problem:
   
   $\lim_{x \to -1} \frac{4x^2 + x}{x} = \frac{4(-1)^2 + (-1)}{-1} = \boxed{-3}$

(3 pts) 2. Define the function $f(x) = \begin{cases} 2x^3 - 1 & x < -2 \\ 2 - x^2 & x \geq -2 \end{cases}$. Compute $\lim_{x \to -2^-} f(x)$, show the details of your reasoning.

   Solution: We use standard techniques:
   
   $\lim_{x \to -2^-} f(x) = \lim_{x \to -2^-} (2x^3 - 1)$ since $x < -2$
   
   $= 2(-2)^3 - 1$ now a skill level 0 problem
   
   $= \boxed{-17}$

(3 pts) 3. Compute $\lim_{x \to 2} \frac{1 - x}{(x - 2)^2}$

   Solution: Notice the denominator goes to zero, but the numerator does not; this indicates a vertical asymptote usually. Because the denominator is squared, it’s always positive. When $x$ is “close” to 2, $1 - x < 0$, that is, when $x$ is “close” to 2 the numerator is negative. The ratio of the numerator and denominator is negative when $x$ is “close” to 2. Thus, we conclude,

   $\lim_{x \to 2} \frac{1 - x}{(x - 2)^2} = -\infty$