1. (2 points) Recall that for \( f(x) \) to be continuous at \( x = a \), THREE THINGS must happen: (1) \( f(a) \) must exist, (2) \( \lim_{x \to a} f(x) \) must exist, and (3) \( \lim_{x \to a} f(x) = f(a) \).

The graph of a particular function \( f(x) \) is shown below. It has discontinuities at \( x = -4 \), \( x = -2 \), \( x = 2 \), and \( x = 4 \).

For each point of discontinuity, circle the first thing that fails to hold. [For example, if (1) and (2) both fail, circle (1) only.]

(a) \( x = -4 \) (1) (2) (3)

(b) \( x = -2 \) (1) (2) (3)

c) \( x = 2 \) (1) (2) (3)

d) \( x = 4 \) (1) (2) (3)
2. (1 point) Find the value of $c$ that would make $f(x)$ continuous at $x = 4$, where

$$f(x) = \begin{cases} 
\frac{x^2 - 2x - 8}{x - 4}, & x \neq 4, \\
\frac{c}{x - 4}, & x = 4.
\end{cases}$$

3. (2 points) Evaluate the following limits at infinity. (Each of these two limits exists.)

(a) \( \lim_{x \to \infty} (\sqrt{9x^2 + x - 3x}) \)

(b) \( \lim_{x \to -\infty} \frac{\sqrt{9x^6 - x}}{x^3 + 1} \)
4. (2 points) Using the limit definition of the derivative, find $f'(x)$ if $f(x) = \frac{7}{\sqrt{x}}$. 
5. (3 points) Using the limit definition of the derivative, find an equation for the tangent line to the graph of

\[ f(x) = 4x - x^2 \]

and the point (1, 3).

6. (Bonus 2 points) Find \( \lim_{x \to \infty} (e^{-6x} \cos x) \)