1. Are the following limits computed correctly? If not, identify where the mistake is made.

\[
\lim_{x \to 1} \frac{x^2 - 1}{x - 1} = \lim_{x \to 1} \frac{(x - 1)(x + 1)}{x - 1} = \lim_{x \to 1} (x + 1) = x + \lim_{x \to 1} 1 = 1 + 1 = 2
\]

\[
\lim_{x \to 0} \frac{x^3 - 4x^2}{x} = \lim_{x \to 0} (x^3 - 4x^2)(1/x) = \left( \lim_{x \to 0} x^3 - 4x^2 \right) \left( \lim_{x \to 0} 1/x \right) = (0 - 0) \cdot \infty = 0
\]

2. Calculate the limit

\[
\lim_{h \to 0} \frac{f(x + h) - f(x)}{h}
\]

where \( f(x) = 3x^2 - x + 1 \).

3. Show, using the definition of the limit, that

\[
\lim_{x \to 6} \frac{x}{3} - 1 = 1.
\]

(Reminder: Given an \( \epsilon \), you need to produce a \( \delta \) satisfying something.)

Bonus: Show, using the definition of the limit, that

\[
\lim_{x \to 0} e^x = 1.
\]

4. Let

\[
g(x) = \frac{4x^3 - 16x}{x^3 - 4x^2 + 3}
\].

a. For what values of \( x \) is \( g(x) \) continuous?

b. What are the roots of \( g(x) \)?

c. Find all vertical asymptotes and compute their one-sided limits.

d. Find all horizontal asymptotes.

e. Draw a graph of \( g(x) \).
5. What value of \( k \) will make the following function continuous?

\[
f(x) = \begin{cases} 
  kx^2 + 3 & x \geq 1 \\
  2x - k & x < 1 
\end{cases}
\]