1. (8 pts) Suppose that the function \( g(x) \) is defined by \( g(x) = \frac{-3x + 1}{x + 2} \).

   a. What is the equation of the secant line through the points P and Q on the graph of \( g(x) = \frac{-3x + 1}{x + 2} \), where the point P has an x-coordinate of 3, and the point Q has an x-coordinate of 5?

   \[
   \begin{align*}
   g(3) &= -\frac{9 + 1}{5} = -\frac{8}{5} \\
   g(5) &= -\frac{15 + 1}{7} = -\frac{14}{7} = -2 \\
   m &= -\frac{2 - \frac{8}{5}}{5 - 3} = \frac{-\frac{2}{5}}{2} = -\frac{1}{5} \\
   \therefore \frac{y}{5} + 2 &= -\frac{1}{5}(x - 5) = -\frac{1}{5}x + 1 \Rightarrow y = -\frac{1}{5}x + 1
   \end{align*}
   \]

   Answer: 

   b. What are the following limits equal to?

   \[
   \begin{align*}
   \lim_{x \to -2} g(x) &= -\infty \\
   \lim_{x \to 3} g(x) &= \infty \\
   \lim_{x \to -\infty} g(x) &= -3 \\
   \lim_{x \to \infty} g(x) &= -3 \\
   \lim_{x \to 0} g(x) &= \frac{1}{2}
   \end{align*}
   \]

2. (8 pts) Evaluate the following limits:

   a. \( \lim_{z \to 0} \sqrt{\frac{1 + az}{a + z}} \), where \( a \) is a positive real number.

   Answer: \( \sqrt{\frac{1}{a}} \)
b. \[ \lim_\limits_{h \to -4} \left( \frac{1}{h} + \frac{1}{4 + h} \right) = \lim_\limits_{h \to -4} \frac{h + 4}{4h} = \lim_\limits_{h \to -4} \frac{1}{4h} = -\frac{1}{16} \]

Answer: \(-\frac{1}{16}\)

c. \[ \lim_\limits_{x \to -1} \left( \frac{x - 1}{x^2 - 1} \right) = \lim_\limits_{x \to -1} \frac{x - 1}{(x - 1)(x + 1)} \]
does not exist

Answer: D, N, E

3. (4 pts) Given the piece-wise defined function \( g(x) = \begin{cases} cx^2 + 2x & \text{if } x < 2 \\ x^3 - cx & \text{if } x \geq 2 \end{cases} \)

For what value of \( c \) does

\[ \lim_\limits_{x \to 2^-} g(x) = \lim_\limits_{x \to 2^+} x^3 - cx = 8 - 2c \]

\[ \lim_\limits_{x \to 2^-} g(x) = \lim_\limits_{x \to 2^-} cx^2 + 2x = c \cdot 4 + 4 \]

we want \( 8 - 2c = c \cdot 4 + 4 \iff 0 = 6c \)

\( \Rightarrow c = \frac{0}{6} = \frac{2}{3} \)

Answer: \( \frac{2}{3} \)