

Show all work.

1. **(7 points)** Answer the following questions relevant to the limit $\lim_{x \rightarrow -3} 4x + 5 = -7$.
- (a) **(2 points)** In terms of the parameter ε , what formal condition corresponds to the goal that $4x + 5$ be “very close” to -7 ?
- (b) **(2 points)** In terms of the parameter δ , what formal condition corresponds to the restriction that x is “very close” to -3 ?
- (c) **(3 points)** When $\varepsilon = 0.2$, what choice of δ suffices to demonstrate that the limit is true? Show your work.
2. **(6 points)** Find values of a and b such that the following piecewise function is continuous everywhere.

$$f(x) = \begin{cases} ax^2 & \text{if } x < 5 \\ \frac{x+3}{x-4} & \text{if } 5 \leq x \leq 11 \\ 2x+b & \text{if } x > 11 \end{cases}$$

3. **(7 points)** Calculate the following limits at infinity; when possible, even if the limit does not exist, use one of the “limit idioms” to describe its behavior.
- (a) **(2 points)** $\lim_{x \rightarrow -\infty} 3 + 2x^2 - x^3$.
- (b) **(2 points)** $\lim_{s \rightarrow +\infty} \frac{s^2 - 3s + 2}{6 - s^2}$.
- (c) **(3 points)** $\lim_{u \rightarrow -\infty} \left(2 \arctan u - \frac{2u^3 - 7u}{u^5 - u^4 + 1} \right)$.