

Show all work.

- (6 points)** Prove that $\lim_{x \rightarrow 2} 5 - 3x = -1$ by finding a satisfactory relationship between epsilon and delta.
- (4 points)** Find a value for the parameter k such that the function $f(x) = \begin{cases} 5 - x & \text{if } x \leq 2 \\ ax^2 & \text{if } x > 2 \end{cases}$ is continuous everywhere.
- (4 points)** Calculate the value of $\lim_{x \rightarrow -\infty} \frac{2-x^3}{7x^4-9x^2}$, or explicitly indicate that it does not exist.
- (6 points)** Let $f(x) = 2x^2 - 3x$. Using the difference quotient, calculate the derivative $f'(2)$.
- (2 point bonus)** Use epsilon-delta methods (or an appropriate analogue thereof) to prove, on the back of this sheet, that $\lim_{x \rightarrow 3^+} \frac{x^2-2x}{2x-6} = +\infty$.