

**50 minutes. No books, no notes, no electronic devices. You must show your work to receive credit.**

1. Evaluate  $\lim_{x \rightarrow 2} \frac{x-2}{x^2+x-6}$ .

2. Evaluate  $\lim_{x \rightarrow 1} \frac{\frac{1}{x-2} + \frac{1}{x}}{x-1}$ .

3. (a) Give the limit definition of what it means for a function  $f$  to be *continuous at a point  $c$* .

(b) Based on your definition in (a), is  $f(x) = \begin{cases} \frac{x^2-1}{x-1} & x \neq 1 \\ 1 & x = 1 \end{cases}$  continuous at  $x = 1$ ? You must show your work.

4. (a) Using **only the limit definition of derivative** calculate  $f'(x)$  for  $f(x) = x^2 + 4x$

(b) Give the equation of the tangent line to the graph of  $f$  at the point  $(1, 5)$ .

5.  $\lim_{x \rightarrow 0} \frac{\sin(\pi x)}{2x}$ . You must show your work to receive credit.

6. Evaluate  $\lim_{x \rightarrow +\infty} \frac{3 - 2x}{\sqrt{3x^2 - 9x + 4}}$ . You must show your work to receive credit.

7. Identify the vertical asymptotes for the graph of  $f(x) = \frac{3x^2 + 1}{x^3 + x^2 - 2x}$ .