This test has pages 1 – 4. Take a moment to make sure you have them all.

No Calculators Allowed; No Reference Materials; Just You and Your Pencil and Eraser.

1. The coordinate squares in the following figure are one unit on a side. The function which generates the non-straight curve in the figure is most likely (check one):

(a) \( f(x) = \frac{1}{x} \)  
(b) \( f(x) = 4x - x^2 \)  
(c) \( f(x) = x^2 - 4x \)

Show limit-algebra steps in finding an equation for the slanty line in the figure.
2 Show limit-algebra steps in finding a $f'(x)$ for the case $f(x) = \frac{x}{x + 4}$.

3 The figure below shows part of the graph of function $g$ along with part of the $x$-axis. On the same figure, make a rough graph of $g'$, showing especially how $g'$ behaves near its $x$-intercepts.
4  State Cauchy’s $\varepsilon - \delta$ definition of

$$\lim_{x \to a} f(x) = L$$

for the case where $f$ is a function defined everywhere on the interval $(-\infty, +\infty)$.

5  Pick one of the following limits and write up a Cauchy-style $\varepsilon - \delta$ proof of its value. The quadratic one is worth more points than the linear one.

(a) $\lim_{x \to 3} (5 - 8x)$  
(b) $\lim_{x \to 2} (3 + 4x - 2x^2)$
Let $f$ be the function whose graph is shown. Let $g(x) = f(x - 2)$. The coordinate squares are one unit on a side.

Fill in the blanks with the appropriate numerical values:

(a) $f(3)$

(b) $f'(-3/2)$

(c) $f(-1)$

(d) $f(0)$

(e) $f(6)$

(f) $f'(0)$

(g) $g'(4)$

(h) $\int_{-2}^{1} f(x) \, dx$

(i) $\int_{1}^{3} f(x) \, dx$

(j) $\int_{0}^{1} g(x) \, dx$

(k) $\lim_{x \to 3^-} f(x)$

(l) $\lim_{x \to 3^+} f(x)$